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# MIND

## A QUARTERLY REVIEW

OF

## PSYCHOLOGY AND PHILOSOPHY.

### I.—PLEASURE AND PAIN.

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THE exhaustive discussion of Pleasure and Pain, in a general thesis, needs an ample reference to the examples in detail as furnished, in the first instance, under Sensation. These examples are sufficiently numerous in themselves to supply a test of any theory, while they have the advantage of calling attention to unquestionably primary modes. The psychical characters can be so far generalised, and, in connexion with the generalities, the question may be put, whether there be anything corresponding in the known physical adjuncts. It is also possible to theorise upon psychical circumstances purely, as in the discussion of certain special instances by Ward and Bradley.

In taking into account the Emotions, there are modes of primitive feeling no less than in the Senses; there being at the same time a wide compass of the non-primitive modes.

Pleasure, in itself, is of course indefinable; but individuals and species may be enumerated. In this enumeration may be constituted representative groups, on which to base a theoretical treatment. Even supposing physical concomitance were left out of account, the generalised characters

would still be considerable and important, as for example in the distinction of massive and acute.

The discussion raised by theorists upon the pleasurable sensibility of the state of drowsiness points to a mode of action of the system that may have a wider range of exemplification. Take the case of cessation of pains generally, and remark that, in some instances at least, there is a notable reaction or recoil of pleasurable feeling. To pass from a glare of light into the shade is not merely cessation of pain, there is also a distinct thrill of grateful feeling. So, to get out of hubbub into stillness is something more than mere cessation of auditory pain, or, to say the least of it, it is something different. We must, however, take account of the continuance of pain in the idea after it has ceased in fact. The higher the pain is in the scale of intellectual retentiveness, the greater would be this persistence, and the greater the interference with the mental repose. It is in the case of the acute physical pains, as toothache, that, the persistent memory being feeble, the grateful reaction is most apparent. The question then arises, does the system provide for a pleasurable condition which is the consequence of remitting such forms of pain as die away from the memory, when no longer stimulated by their external causes? If there were such a law, the pleasure of going to sleep, as the cessation of conscious activity of any kind and of muscular activity in particular, would be a marked exemplification. That there are forms of remission of activity, whether painful or not, that manifest this reaction only in a slight degree, might affect the generality of the proposition, but would not do away with it. There would thus emerge the class of cases already cited, where the principle is an operating circumstance in human pleasure.

Another way of looking at the same phenomenon is, to take the aspect of congratulation or rejoicing over an escape or a deliverance from some great evil. This position would be strengthened, if not created, by our having made up our minds for a time that the evil was to prove more lasting than it actually turns out to have been. Such a state of itself would seem to be necessarily agreeable, in common with sudden access of good fortune generally. It removes the case from the situation first assumed, namely, simple cessation of pain, unaccompanied with reflexion, calculation, expectation, or dread, and does not therefore give any insight into that situation. It belongs rather to the wide department of pleasure and pain in their ideal modes, or as contemplated in advance or else in retrospect. An extreme

instance would be furnished by the exultation of victory, which is a great deal more than the cessation of the strain of fighting and the sense of danger.

The designation "Relativity" covers a wide field more or less allied to the situations now reviewed. As applied to the example of light and shade, it would signify that the gratefulness of shade presupposed a certain continuance of glare, without which it could not exist; just as the pleasure of warmth supposes a certain previous chillness. The nice point to consider here is, whether the previous condition must be exaggerated to the pitch of pain, in order that the recoil may be agreeable. This would be decisive of the problem. Does nature give a pleasure of relief or recoil after exertion or exercise, although not pushed to the point of pain? For if this were so, then the pleasure of muscular repose or drowsiness would be a positive institution, an addition to the sum of pleasure, without the cost of previous pain. No doubt the presence of a certain amount of pain heightens the relish for the change, yet this needs to depend upon a distinct law of the system and is not obviously a consequence of the other. We might hypothetically conceive of it as contributing to the physical stimulation that underlies the very fact of change, or the remission of one exercise to assume something opposite or different.

We have to take along with us the circumstance that all the organs associated with pleasure, and often exercised in that way, assume periodical conditions of craving, which it is painful to deny or refuse. Such is the pain of being immured in the dark, as contrasted with the pleasure of darkness following on glare. Probably the eye is the extreme instance of this craving; there being reason to suppose that the stimulus of light contributes directly or indirectly to the healthy organic functions. It may not be the same with hearing, except that the ear is the medium of sociability, for which there is a natural recurrent craving.

What is peculiar to Relativity is partly, but not wholly, included in the general law that every organ needs exercise, or at all events relishes such, in proportion to its active endowment. This is adequately expressed by the law of rotation, or change, from which we can draw numerous corollaries and find the most abundant exemplifications in every region of our sensibility. The corollary that comes closest to Relativity is that, in proportion to privation, or length of interval of gratification, is the intensity of the pleasure when it arrives. This principle in appearance covers our initial instances of drowsiness and the like, but

only on the surface ; for it would have first to be established that these are independent sources of pleasurable sensibility.

The indirect operation of pain in contributing to pleasure has to be exhausted in those more simple aspects, before grappling with its wider developments as seen under the higher emotions and the intellect. Even the most elementary of these higher situations, the pungency of a slight shock of fear, may not be altogether organic, although, if partly so, it would exemplify a natural tendency that might cover some of the problematic instances formerly adduced. Yet nothing would seem to enable us to dispense with the necessity or propriety of viewing every species of pleasure or pain on its own merits, after which generalities of greater or less range might be suggested.

In our farther search for such generalities, we may begin with a review of the Sensations, as recognised in their proper hedonic capacity. It is impossible, even at the outset, to refuse the guidance of certain hypothetical considerations that have been adduced with reference both to Sensation and to other modes of Pleasure and Pain. For example, the dependence of Pleasure upon harmony and Pain upon discord, conflict, or opposing tension, would seem to require, as an assumption, that perfectly elementary sensibilities, those into which even our usual sensations may be analysed, give birth to little or no pleasure. Against this hypothesis is another, proceeding upon the fact that Sensation, as such, is pleasant, while susceptible of increase or diminution from a variety of incidents.

Let us take as a commencement the sense of Hearing. According to Helmholtz, sweetness in sound is the consequence of a peculiar arrangement of upper tones, being in fact a case of harmony. As put by Tyndall, a perfectly simple sound, unaccompanied by upper tones, is insipid. This is a remarkable admission. It militates against our supposing Sensation as such to be pleasurable, and this without reference to intensity, except perhaps in the extreme forms of acuteness. The insipidity alleged would not exclude the slight beginnings of pleasure, which might become a perceptible quantity in reference to prior stillness, prior discord, painful acuteness, or great freshness of the organs.

The case now stated is in some degree illustrated by the other mechanical sense—Touch. Bare touch in its least complicated form may receive Tyndall's epithet of insipid ; while there is nothing to constitute the equivalent of harmonic upper tones. Warmth or coolness is a superadded

element; the only favourable situation for touch in its purity is voluminous softness.

The case of Sight may next be studied. Mere light is undoubtedly a positive pleasure of considerable amount, and is not to be treated as coming under the stigma of being insipid. The only condition for maximising the pleasure is a due regard to Relativity, as remission, alternation, variation, and regulation of intensity. It is known, however, that light is a compound agent; we are acquainted with its constituents, *viz.*, the colours of the spectrum, and we can test these individually as pleasurable or painful agencies. In appropriate circumstances, we may derive pleasure from any one of the colours or shades of colour, while their combination in particular ways is still more markedly agreeable. The theory of this effect is burdened with serious difficulties. First of all, referring to the simple shades and gradations of colour, some are accounted especially rich in their operation on the eye, a richness that might partly depend on brilliancy, but is not fully accounted for in that way. Associations, some perhaps hereditary, may come into play, but their sources are at present obscure.

The discussion of Taste and Smell somewhat varies the illustration, while the two senses are almost on a parallel in what they suggest. It is here that the difficulties of the hypothesis of the intrinsic pleasure of Sensation are at the maximum. Accordingly the resort is to an extreme hypothesis to bring about a reconciliation. At first blush, we are confronted with certain appearances such as we may interpret in the following fashion.

The case of Smell is perhaps at once the most simple and the most suggestive. The generalisation that connects sweet odours with the hydrocarbons, and malodours with compounds containing nitrogen and sulphur, would appear to point to a primitive and inerasable difference in nervous susceptibility, of a kind that cannot be explained away by either varying intensity or associated effects. We seem at once driven upon the hypothesis that a certain class of chemical agents impart to the nervous substance the atomic modification that is the sign and adjunct of pleasurable feeling; and so with the production of pain. These effects also appear to begin and end in themselves; they have little or no bearing upon the well-being or ill-being of the system generally. They thus typify to us one of the characteristic sources of our pleasurable and painful sensibility.

Referring now to the sense of Taste, we shall find a certain amount of agreement with the foregoing hypothesis.

The sweet and bitter tastes may in all probability be referred to fundamental differences of chemical agency; assuming these to be of the simplest or most elementary kind, as in the contrast between sugar and bitter aloes. When tastes become more complicated, we see the play of opposites, with the effect of mutual conflict and the right of the stronger. As regards food, we have the additional circumstance of relish, which, however, finds its best elucidation when taken along with the feelings of digestion.

The vast array of Organic Sensations necessarily involves a wide range of examples illustrative of the causes of pleasure and pain. It is most convenient, and may prove in the end most suggestive, to attack these by selection rather than by systematic review.

The example of alcoholic stimulation is favourable as a hypothetical study. Upon the common basis of alcohol, in its absolute character, there is an endless variety of modifying compounds, and the substances that enter into their composition are, to a certain extent, known and understood. Looking to the effect of alcohol by itself, we may form some hypothetical assumption as to its mode of working; that is to say, we may take note on the one hand of the subjective fact of mental elation, and on the other of the chemical agency of alcohol as a solvent of some constituent of the nervous tissue: and, however vague this hypothesis may be, we, at least, see no ground for considering it as otherwise than a primordial and independent physical influence. Of course, we are empirically aware, that this is one of the cases where the nervous system is awakened to a pleasurable response, while at the same time it is speedily brought into a state of exhaustion, with debility of function and neural pain.

This general supposition is instructively qualified by what we know of the concrete alcoholic bodies. We know, for example, that some of them are especially mischievous, and that the mischief is due to the presence of impure ingredients that especially grate upon the nerve substance. These are found in coarse and inferior types of the alcoholic beverages; and it is the object of the manufacturer to arrest or remove such agents, while the effect of long keeping is to bring about their decomposition. On the other hand, it seems to be determined, chemically, that the choice and delicate flavour of the most precious varieties of wines and spirits are due to certain ethers that are evolved in company with alcohol proper. The case of malt whisky illustrates both circumstances. The removal of fusel oil is the essential

purification, and the presence of certain recognised ethers is the source of the characteristic flavour of the spirit. Now, when we take into account the extraordinary difference to the sense, and to the limits of endurance without nervous mischief, between alcohol in its plainer forms and alcohol in the delicate spirits and wines, we have an example of pleasure produced by complex harmony not improperly comparable to the effect of sweetness in sound by the presence of upper tones. Possibly these accessory ethers admit of being both felicitously and infelicitously grouped or aggregated. At all events, they induce a wide deviation from the subjective results of alcohol *per se*. The example, taken as a whole, is no doubt representative; it has parallels, at least, in the other members of the class of nerve stimulants—tea, coffee, tobacco, and the rest; while, out of this region altogether, the principle of action exemplified may be presumed to hold.

For the next selection we may refer to organic sensibilities where the mode of operation is more or less mechanical, and in consequence easily understood. Take, then, the case of simple injury of a sensitive tissue by cutting, tearing, squeezing, or mechanical violence generally. A certain injury is done in the first instance to a sensory surface, say the skin; the nerve fibres distributed to the surface, are either injured themselves or receive a shock from the injured part of the sensory surface. It is clear, however, that they cannot escape disorganisation on their own account. Here we have a study of pain in a very intelligible situation. It supplies us with the inference that, in order to exemption from suffering, the material of the nerves must be whole and intact, that its disruption or violent compression is at once a cause of acute suffering, to which pathology adds the farther injury of inflammatory change. Probably, in all the more violent forms of painful malady, mechanical or chemical injury or derangement of the nerve tissue is implicated; it being a moot point how far the painful derangements of sensitive organs are operative by inducing a specific derangement of nerve substance, or simply by inducing an unfavourable type of nerve current; both suppositions are admissible.

The study of mechanical effects on the nerve material may be made to include the operation of Heat and Cold as sources of sensibility. Either of the two agencies, in the extreme, is productive of disorganisation of tissue, and closely resembles, both physically and mentally, the case of mechanical hurt. The novel point of interest here is to

take note of the milder applications of thermal agency, in which are included some of our most habitual pleasures.

The variations of temperature, within the limits of endurance, include a considerable range of both comfortable and uncomfortable sensations, the amount being very considerable whether taken as acute or as massive. Simple increase of temperature might be regarded as one of the most conceivable types of nervous stimulation, being, in this respect, at an advantage as compared with chemical agents. Still the attempt to formulate the precise physical influence of a slight increase or decrease of warmth on the surface of the skin, with a view to a theory of pleasure and pain, cannot at present go very far. It is one of the cases where a small stimulus can give pleasure, as in the increase of warmth under certain circumstances, while a limit is very soon reached where the pleasure passes into pain. This is merely one among other examples of a wide-ranging law of our sensibility. More pointed and specific are the two following observations.

In the first place, it is under this agency that we have perhaps the best illustration of the law of Relativity in its most decided and intelligible form. The transition from one degree of temperature to another is an essential condition of the sensation of heat or cold. Moreover, the fact of pleasure, or of pain, is equally a matter of correlation. A degree of the thermometer that in one circumstance gives pleasure, in another gives pain; and this is true of the agency in itself, or without reference to any other agency that may be operative at the time. The examples of this purest type of Relativity are not numerous in the human system. They are found in connexion with the muscles, but only in a moderate degree with the five special senses.

The second observation is this: Although heat and cold are essentially bound up with bodily health and well-being, and although there is a frequent coincidence between their pleasurable modes and physical well-being, and the opposite with pains, yet the concurrence of the two facts does not hold throughout; so that we cannot treat this sensibility under any general law of conservation. It is notorious that the pleasure of warmth subsists at degrees of temperature that are unwholesome and debilitating; and that the pain of cold goes frequently along with a temperature that is positively invigorating. Indeed, as far as the health of the body is concerned, a certain pitch of coolness, such as to tax endurance, is the most favourable to bodily vigour.

The sensation of agreeable warmth is so far *sui generis*

that it is not mistaken for any other; but just as the extreme hurtful applications of temperature resemble in psychical tone the wounds and acute injuries of the inflammatory type, so the milder forms of warmth have something in common with vague sensations of several other organs when under their healthy manifestations. In the scale of vagueness, it ranks next to mere nervous elevation, as in the gentle warmth of air or water at blood heat.

The pleasurable results of variation of temperature are little experienced in tropical regions or in the warm summers of the temperate zone. The law of Relativity does not, as Plato supposed, make our pleasures and pains exactly equal; even in the winter of temperate and cold climates there may be a very large amount of pleasurable warmth, while the pains of cold may be few and distant.

*The Muscular System.* The pleasurable and painful feelings connected with the muscles, to which allusion has already been made, while co-operating in some points with the views already expressed, are suggestive and illustrative of other important generalities bearing on the present theme. They put before us, in a palpable shape, the law of exercise of function as a cause of pleasure, due regard being paid to the limits of strength; while pain is the consequence of trespassing those limits.

It is difficult to fix the character of the muscular sensibility under exertion so as to give it in typical purity; there are usually accompanying modes of sensibility often more acute than the simple feeling of muscle. Nevertheless, it is not impossible to satisfy ourselves as to the precise nature and possible amount of pleasure attainable under muscular exercise by itself in certain given circumstances. But what concerns us here is to detect the conditions of a general kind that bring the case into comparison with other sensibilities. For one thing we have already remarked, that the pleasure of cessation, or repose, after exercise, is a fact empirically ascertained and not apparently due to any necessity or implication of the pleasure of activity. Probably in no other part of the system is there such a marked example of a large volume of gratification arising from mere cessation of active function. The chemistry of muscular recuperation and nutrition is partly known and may be suggestive; but it is scarcely paralleled by illustrative comparison with the other organs whose exercise develops sensibility.

Muscular exhaustion and inaction can be studied in one very important collateral or consequence; *viz.*, the inducing of sleep, to which perfect muscular quiescence is essential.

So important is this part of the case, that sleep can be caused or hastened, out of its natural time or routine, by unusual muscular expenditure followed by the repose of exhaustion. Hence the ordinary feeling of drowsiness has much in common with rest after muscular fatigue, and may accordingly be viewed as in a measure made up of muscular sensibility under total remission of active exertion. It seems hopeless to treat this pleasure as a compound of any known simples. We may rather accept it as a distinct organic effect annexed more especially to our muscular system, and partly statable in terms of chemical and physiological processes, from which we may draw whatever inference we may see fit.

The grateful feeling of muscular exercise admits of being given either as a simple quality attaching to the muscular system, or as one of our Appetites, which is the same fact in its bearing on the Will. We are said to have an appetite or craving for action, the motive being in the first instance the pain of inaction. After an interval of repose and refreshment, the active system is, as it were, wound up to expend its energy, and for us to be restrained is to undergo a certain amount of suffering. The consequence is, that the pain acts as a voluntary motive to put forth exertion; while, as in other appetites, the pleasure of the exercise is a farther motive to continue the state until the craving is fully satisfied. If, in consequence of extraneous motives, that is, the urgency of some work to be done, the exertion is still farther prolonged, the pain of fatigue comes on and constitutes a new motive or craving for cessation or repose. To all this there applies the remark made with reference to heat and cold; *viz.*, that the course of our muscular sensibility promotes, in a general way, the health of the system, but not to its whole extent. The sense of fatigue, with its urgency to cessation of exercise, springs up before the full benefit has been attained in the way of healthy stimulus. Muscularity is therefore another testimony to the insufficiency of Sensation as a guide to health and self-conservation.

The pains specific to muscle are notable and unique. There may be many varieties of suffering, some common to the tissues generally, but the pain by pre-eminence is that expressed by cramp or spasm, and is one of the worst ills that flesh is heir to. Arising from a conflict of tension in the muscular fibres, it may be said to be typical of one wide-ranging generality of pain, the pain of opposition, contradiction, or collision of hostile promptings. It is, however, too simple and elementary to throw light upon

the higher complications coming under this head; it may be more properly regarded as a simple incident or ultimate fact of our muscular system. The physiological fact is tolerably well known, and the subjective experience is also known. We have many kinds of physical pain, but this has a peculiarity of its own, and could not be understood through any of the others. As a nervous phenomenon, we can simply say that when a muscular fibre is violently contracted by a morbid excess of motor stimulus, while at the same time something checks its contraction, the sensitive fibres of the muscle undergo a violent irritation in the mode that is specifically painful. Of course there is a certain salutary efficacy in the stimulus, as doubtless the occasion is a morbid phenomenon that cannot be too soon ended; yet here too we may say that there is no obvious proportion between the pain and the derangement to be rectified; a smaller amount of suffering would probably induce us to do whatever can be done to set matters right. In point of fact, there may be an equal, but certainly not a greater, pitch of suffering in any other seat of sensibility. The cramp stage in Asiatic cholera, affecting both involuntary and voluntary muscles, could not be surpassed by any known variety of torture.

*Organs of Digestion.* In this region also we have a large volume of sensibility, pleasurable and painful, with specific characters that are well marked, and exercising a powerful influence upon the mind. The feelings associated with digestion include some of the so-called Appetites, being periodic cravings whose gratification belongs to the maintenance of the human system. The supply of nutritive matter to the blood as the medium of regeneration of the various tissues takes place through the stomach, which must first prepare the food-material for its destination. In so doing, the stomach with its appendages acquires interests of its own, and has a set of feelings peculiar to itself. While the health of the system simply requires that there should always be nutritive matter in the blood, including also the removal of what is effete, the stomach settles its own times of receiving food and of going through its various stages of manipulation. In all this, it manifests an extraordinary intimacy with the brain in respect of massive sensation, agreeable or the opposite. As a guide in the conduct and economy of life, it has the same merits and defects as warmth and muscularity; it keeps us in the proper track of self-conservation for a certain length, and then deserts us. In other respects, the chemistry and physiology of digestion

offer but a very limited insight into the kinds of nervous stimulation that are accompanied by pleasure and pain. The characteristic form of pain, *viz.*, sickness and nausea, is the extreme manifestation of stomachic disturbance, of which ordinary hunger may be an incipient stage, although perhaps also allied to the *ultima ratio* of alimentary cramp. The appetising force of our digestive states is the antithesis to all these extremes ; whence we rise up to the genial feeling of healthy digestion, with its commanding influence over the entire mental tone.

*Respiratory Feelings.* The function of Respiration, whose organ is the lungs, is to supply our aerial food in the shape of oxygen, and to remove the principal aerial impurity—carbonic acid. A bellows-like action is sustained for this purpose by the operation of a group of muscles operating without intermission through certain known nervous centres. In ordinary circumstances, little or no sensibility belongs to the process, the reason being its unbroken continuance. It is one of the best examples of the law of Relativity, that is, the necessity of change as a condition of consciousness.

As with the organs last discussed, the speciality of respiratory feeling, when it does arise, is its extreme form of pain, known as suffocation. The endeavour to restrain the action of breathing is attended with a distressing sensation that becomes at last insupportable. As a pain of conflict, it resembles the muscular pains of spasm, and in fact contains a muscular element, although this is not the whole. There is a complex sensibility arising from the refusal to supply oxygen to the lungs and remove carbonic acid. At the same time, the pain would seem to be in advance of our positive wants in these respects. Notwithstanding the urgency of the respiratory interest, many facts show that, for an interval of several minutes, the exchange of gases in the lungs may be suspended without fatal consequences. It would seem, therefore, that the interference with the established rhythm of the breathing function is the more immediate cause of the painful conflict ; the resistance to the nervous discharge from the respiratory centres inducing the painful sensation of conflict, muscular and nervous. As in other cases, the precaution is in advance of the danger, if not excessive in degree ; that is to say, a smaller pain might possibly keep us aware of the needs of respiration.

This last remark would appear to be still more applicable to the special respiratory outbursts—coughing and sneezing. These are produced by painful irritations of surfaces that need to be kept free from foreign bodies and irritating agents.

The respiratory spasm operates as a remedy; but, so far as appears, it is greatly overdone, being often prompted in disease when there is nothing tangible to get rid of.

The pleasurable feelings connected with respiration are not in themselves pronounced, owing doubtless to the working of relativity, which requires a change or deviation from even persistence in order to make us conscious. The fluctuations of pure and impure air have their effect; the one leading to a general exhilaration, the other to the opposite extreme, and tending at last to a form of suffocation. The pleasurable side of the case belongs to that wide department of pleasure connected with any notable advancement in healthy functions, an effect that in the end must show itself in raising the normal condition of the nervous substance, both nerves and centres. The same hypothetical rendering is applicable to the obverse view, or to the pain and depression due to deficiency in the exchange of gases in the lungs. The influence of poisonous ingredients would naturally have the same interpretation, but, here, as in other cases, we make a distinction between agents that interfere with respiration without the warning of pain, and others that cause irritation while not necessarily mischievous. Whether chlorine and sulphurous acid are injurious to the lungs in proportion to their irritative quality, I am unable to say; but carbonic acid, carbonic oxide, and carbonated hydrogen (perfectly pure, which coal gas is not), are all speedily fatal without the warning of pain.

*Electricity.* As a physical agent, electricity is tolerably well understood. It is, at least, as intelligible as heat, or chemical action. Some help may, therefore, be derived in framing a hypothesis of the physical side of our simple pleasures and pains, by remarking the various subjective consequences of electrical shocks and currents. Hardly any of these can be quoted on the side of pleasure; they are mostly indifferent or else painful, the transition from indifference to pain being mainly a change of intensity. A simple shock from a Leyden jar is something of the nature of a stunning blow; while the sparks from the machine upon the knuckle are of the nature of a smart prick. A sustained voltaic current makes a sensation of heat, and is felt along the track of the nerves to the brain. The most rousing of all the electrical influences is the Faradaic current of the magneto-electric machine, which is known to be an incessant making and breaking of contact, with reversal of current at each turn. In small quantities, this is tolerable, and even considered as a wholesome stimulant or remedy in certain ailments. In

higher degrees, it amounts to intense agony, proving that its mode of action on the nerves is of the most unfavourable kind. After the mental state reaches the point of the unendurable, it is just possible that its continuance would be a destructive disorganisation of the nervous tissue. If this were not the case, or if the pain were out of proportion to the injury caused to the nerves, this would be the most efficient and least objectionable of modes of using corporeal pains as a moral discipline.

*The Nervous System.* In making the nervous system, in its own proper nature, a study, we have to draw a distinction between the changes in its working caused by the various sensitive organs operating as stimuli and those changes due to its own state of nutrition, or integrity, or the reverse. The line thus drawn is not easy to observe at all points; nevertheless, it is sufficiently well known that the brain and nerves, as a whole, are liable to fluctuations in their sound or unsound condition, and that well-marked subjective consequences attend these fluctuations. The supply of blood, in proper quality and amount, is a part of the necessary requirements; and as this changes so does the nervous efficiency for all leading mental functions.

While the phases of brain efficiency, grounded on independent variations in its substance, are numerous beyond reckoning, it is both safe and sufficient to indicate a few leading and well-recognised modes of alteration.

First. We can suppose an ideal perfection of the healthy constitution of the nerve substance in its own proper character, and can fairly conclude that the subjective accompaniment is a high degree of mental efficiency—in other words, a vigorous response to whatever prompting may be uppermost. This by no means decides what the outcome will be; we must accept as a fact that different brains, in an equal state of efficiency, differ in the modes of healthy exertion favoured by them. The emotional tone, or feeling of hilarious existence, will always gain more or less in the situation supposed. As a matter of course, the aid furnished by the prime condition of the various organic functions is so far contributory to the high nervous condition.

Second. The foregoing assumption implies, as its obverse or opposite, a deficiency or depression in the integrity of the nervous substance, with a corresponding loss of mental working power in whole or in part.

Third. The innumerable disorders that affect the nervous system, while not necessarily affecting its general efficiency, bring about such changes of tissue as are usually the har-

bingers of pain. The so-called neuralgic affections, involving inflammatory or other changes in the substance, are illustrative of the modes of nervous alteration that give rise to acute painful sensibility. Against these we must set off other changes damaging to the substance, as shown by the issue, but not productive of immediate pain. We are therefore prevented from believing that the many kinds of acute suffering assignable to nerve ailments are really protective in the degree of their urgency.

Fourth. As with the muscular system, the instrument of the brain's activity, there are pleasures and pains of exercise and rest, so with the brain itself, but with some important differences. We may hypothetically assign part of the pleasure of healthy exertion to the nervous centres in their own separate character; and, in like manner, we may suppose that nervous over-fatigue gives rise to pain on its own account, whether massive or acute. What seems peculiar to the exhaustion of the nerves is the occurrence of a point where cessation does not give the immediate feeling of repose. Indeed we can hardly trace, in connexion with the nerves, that luxurious and spontaneous feeling of rest that distinguishes the muscular system; we are more familiar with the morbid continuance of thought-activity, which is as oppressive as the over-exertion that brings it about.

Fifth. In certain forms of excitement, connected with pleasurable indulgences to excess, there occurs the feeling of fatigue or exhaustion, which should be accepted as Nature's hint to discontinue the stimulation, but, being neglected, often leads to a revival of the tone of enjoyment. A very probable explanation is to the effect, that the circulation in the brain has been unduly increased, and is of the kind that favours the exaltation of pleasure; the debt to Nature being paid by subsequent prolongation of the period of recuperative rest.

*Anæsthetics.* The physical causes of pain, as growing out of our elementary sensibilities, should naturally receive elucidation from the study of the different anæsthetics. In point of fact, however, the inferences drawn from these do not assist us in the study of the special modes of pain. What is effected by them is summed up in the suspension of Consciousness as a whole, whatever may have been its pre-occupation—pain, pleasure, thinking, will. Consequently, the action of the anæsthetic drugs, if we could fathom it, would be a contribution to our acquaintance with the physical conditions of consciousness in general. On that view of consciousness that regards the muscular response

as the essential complement of every mental situation, the theory of anæsthetics would involve some means of interfering with the muscular promptings. Lastly, the influence of persistence and habituation, in modifying both pains and pleasures, has a like general bearing, and does little to assist us in giving reasons for the differences between the two classes.

*Tickling.* The peculiar sensation of tickling is one of the anomalies that obstruct our endeavours to arrive at general laws of pleasure and pain. The slightness of the contact, as contrasted with the intolerable discomfort, is singular and as yet inexplicable. Some part of the effect may be due to the spasmodic reflex actions, which the will cannot control; but that merely shifts the difficulty, while it can scarcely be looked upon as the whole case.

*Summing up for Simple Feelings.* Before passing to the complications of pleasurable and painful sensibility, or those cases where concurrence of a plurality of stimulants is an essential circumstance, we may at once endeavour to sum up the conclusions obtainable from the foregoing survey.

The results are apparent from the nature of the running commentary passed upon the individual cases. They are negative rather than positive.

First. One general consideration has much in its favour, namely, that extreme violence or intensity of nervous stimulation, as measured by destruction or mutilation of tissue, whether of the sense surface or the nerves, is usually attended with pain. This evidently holds in a large proportion of instances. It is, however, subject to important qualifications or anomalies, such as beset the whole speculation that we are engaged in. For one thing, destruction or disorganisation of a palpable kind may overtake the sense organs, as well as the nervous substance, without any pain. In the second place, many acute pains attend upon derangements so slight as to have no serious effect upon our general well-being.

Second. There is a considerable amount of coincidence between pleasure and the nourishment and vitality of the system, through the supply of nutrition and the removal of waste, with the obverse effect of pain in the contrasting situation. The principal examples of this concurrence need not be repeated.

Third. There is pleasure in the exertion of all the active faculties—muscles, senses, brain—with a painful feeling of fatigue to determine the limit of active competence. The test thus supplied is not perfectly accurate for its purpose,

giving a premature indication which has to be disregarded if we would obtain the full measure of our capability.

Fourth. The pleasure attached to rest and remission after fatigue is somewhat various; being most conspicuous in regard to the muscles, while wanting in the senses and the nerves, or attainable only by careful limitation of the proper degree of exhaustion.

Fifth. The infelicitous arrangement whereby acute pains attend nervous disorders that are indifferent as regards the general well-being of the system, is qualified by the important fact that we have many acute nervous pleasures beginning and ending in the brain itself and neither exalting nor depressing the organic functions that are the support of life. This remark will be found especially applicable to the compound forms of pleasure. A certain number, indeed, of these acute pleasures have the known effect of exhausting by overstimulation the nervous vigour.

The pleasures and pains that pass beyond the stage of simplicity, and owe their character to the fact of union or combination, are by far the largest number of our pleasurable and painful experiences. The circumstance of plurality and combination assumes two obvious forms, namely, harmony and conflict.

The study of actual sensations has to be supplemented by study of the memory or the Ideas of them. The bearing of this new modification is all-important and wide-ranging, and contributes its share to elucidate the laws that we are in quest of. The conditions of harmony and conflict enter abundantly into the field of Ideas.

*Different Aspects of Harmony and Conflict.* Here we must draw a broad line between two very different classes of mental facts that receive the present couple of designations. In the every-day pursuits of actual life, we may have our aims, expectations, and pursuits either aided, realised, and fulfilled, or else thwarted and baffled. The one case is attended with pleasure, the other with pain. The names harmony and conflict, however, are not the only, nor the best, modes of describing the two respective situations. We wish a thing, and endeavour to attain it, because it would give us satisfaction. To be aided and furthered in the pursuit is so much gratification already secured; to be opposed, contradicted, thwarted, is simply privation of a looked-for good; and this species of pain needs no recondite handling. There can hardly be any fact more elementary than that the gain of a pleasure is pleasant, and its loss correspondingly painful. To receive aid and support in our

various endeavours is the same as to be successful in those endeavours, and obversely.[1]

Every circumstance that, on the one hand, lightens or eases our labours and burdens, or, on the other hand, increases or aggravates them, is pleasurable or painful according to the case. This, too, is a mere necessity of our constitution, and not a separate law of the mind. There is a pleasure in putting forth a degree of exertion within our strength and our skill; the opposite is painful. Vision in a clear light, our eyes being good, is a grateful exercise; the contrary entails suffering. To have the attention distracted by collateral solicitations is a pain of conflict, otherwise expressed by loss of strength and marring of efficiency.

[1] Mr. Bradley, in dwelling upon Conflict as a cause of pain, makes application of it to show that Surprise cannot be a neutral state, that is, indifferent to pleasure or pain. It seems to me, however, that the facts, when examined, are against him. There can be little doubt that surprises are often painful, as well as often pleasurable; yet, as these effects must be of all degrees, there ought to be a point in the scale where both kinds are at zero. Our familiar experience seems to show that surprise, as frustrating an expectation, has its character determined by what the expectation is. If I am bent on an important errand, and find my way blocked by an unforeseen obstacle, I suffer all the pain of being thwarted in something that I put a high value upon. This is the pain of conflict as regards pursuit in the objects of every-day life. If, however, I am out for a walk with no special object in view beyond the mere agreeable exercise, I may find a stoppage that I did not count upon, and may mark it as such, without being in the least degree pained or annoyed; the reason simply is that nothing depends upon my following any one particular route. There is a real surprise of the kind that awakens attention and impresses the memory with a fact of my surrounding, but the effect ends in this purely intellectual result. If in the supposed saunter I encountered a sudden shower of rain, that would be a surprise relevant to the situation; it would thwart me in the manner that I could feel, but simply because it interfered with my expected gratification. Thus it is, that all deviations from our accustomed routine in the course of things contain the intellectual shock of surprise, while only those that thwart us in some important end of pursuit can be cited as exemplifying the pains of conflict.

Intellectual Surprise is to all intents identical with what we term Novelty, which has an influence of its own partly intellectual and partly emotional. The intellectual element is the most constant. If a novel experience does nothing else, it makes an impression and abides in the memory. When we go into some new place, we count upon and expect novelties, and therefore cannot be said to be surprised in the sense of violated expectation. While the intellectual act is thus constant, the resulting feelings vary with the special incidents of the case. Our anticipations may be baffled in two different ways: we may find greater changes than we had been prepared for, or sameness where we expected change. These are surprises properly so called, but whether they gave us any degree of pain would depend upon how far we had set our heart upon our framed expectations.

Further variety of the same contrast is the difference between friendly sympathy, on the one hand, and discouragement or the counter of sympathy on the other.

The case more immediately suggested by the couple "harmony" and "discord" is what is commonly called artistic or æsthetic pleasure and pain. This opens a very wide department, but if we confine our view to its more essential peculiarity, as distinguished from the wide-ranging class of facts just alluded to, we find that it resolves itself into the subtle operation of concurrence between effects differing in their own proper nature while possessing something in common. The answering of sound to sense is a familiar example, and is well known to be a cause of pleasure in proportion to the completeness of the adaptation. So with harmonies in the different pitches of sound; and, likewise, agreeable unions of colour. Many attempts are made to explain the pleasure of this kind of harmony, but with very indifferent success. It is a safe assumption, that if the mind is solicited at two or more different points, and if the resulting sensations (being regarded as severally agreeable) have so much of a common character as to be mutually supporting, the nervous expenditure required to maintain the pleasurable states will be reduced, and we shall be gainers in consequence. Thus it is that a band of music accompanying a dance, or a march, besides being pleasant in itself, adds to the pleasure of the active state by chiming in with its particular pace. Such an assumption goes a certain way, but the facts very soon outstrip its capabilities. The notable circumstance in connexion with harmony is the astonishingly intense pleasure attainable from its higher modes—that is to say, as the harmony increases, the pleasure also increases out of all proportion. What is there in a fine voice to make such an extraordinary impression on the senses and the mind, as compared with a more ordinary one? The physical difference of the two is supposed to be resolvable into a readjustment of the over-tones that make up the special timbre of each; and how such minute adjustments can suffice to make the difference between an average singer and Mario, or Jenny Lind, is utterly baffling in our present knowledge. We have already had a parallel difficulty in the delicacy of stimulants and articles of food for which no explanation can as yet be offered.

The same difficulty appears in æsthetic combinations of a still higher kind, as in a musical air or a poetical cadence. That a certain succession of notes, the so-called musical

sentence or theme, should have a perennial charm to the human ear, is a fact that has been partly, but not fully, accounted for. The three circumstances that have been adduced by Sully and others, *viz.*, musical concord of successive notes, intellectual unity, and expression of emotion, completely fail when applied to the extreme cases. For, as shown by Gurney, there is some residual element of fascination at present beyond the reach of analysis. Possibly the elements that have been assigned, and more especially the delicate expression of emotion, might suffice for the explanation if our means of analysis and verbal definition were equal to the subtlety of the case. As it is, we find ourselves face to face with an insoluble puzzle. The felicities of our poets have been subjected to a critical scrutiny by Gurney; and although the constituents are more tangible in poetry than in music by itself, he maintains, with apparent success, the inscrutability of the resulting emotion.

To cite another example. The charm arising from the human form is partly explicable by circumstances that have been assigned, but with the same residual difficulty in accounting for the extraordinary rate of increase as the points of excellence are refined upon.

*Elementary Emotions.* The illustration of Harmony and Conflict has carried the discussion beyond the simpler states of feeling into the higher compounds where Sense and Idea come together. There still remains, however, a certain range of feelings not absolutely simple, yet relatively so, while entering into many important compounds. These are the more fundamental or elementary emotions of the mind, which seem to be rooted in organic and other primitive modes of stimulation. The most prominent and wide-ranging of these elementary modes of the higher feelings appear to be Love, Anger, and Fear. They are all associated with distinct organical changes, seemingly part of their nature physically viewed. In regard to the love circle of Feelings there are also specific glandular secretions, through which the emotions themselves can be awakened. In the case of the angry or malevolent outbursts, there occur violent displays of activity, as well as disturbances of the circulation through the heart's action. In fear also are exhibited disturbances of a specific nature, affecting the muscular system in the way of depression and producing derangements in the organs of excretion.

So far as the study of these effects can carry us, the inferences are at some points confirmatory of previous

inductions. The case of Fear as a depressing emotion is most nearly related to our leading generality; *viz.*, the connexion of pain with lowering of general vitality. As regards Anger, the physical seat must be referred to a region of the nervous system expressly organised for manifesting the passion. It fraternises with no other mode of mind, and is sufficiently prominent to stand by itself; while the inductive study of its manifestations is the chief source of our knowledge respecting it.

The Amicable emotions, involving the love feeling in various distinguishable varieties, have likewise definite nervous seats, of which we can give no farther explanation, being also supported by organic secretions special to themselves. Assuming that their pleasurable character has something to do with those purely organic stimulations, we can simply remark of them that they have a special efficacy in affecting the nerves, in the direction of pleasure, and are not at the same time connected with the furtherance of vitality.

*Pleasures and Pains in Connexion with Ideas.* The field of Ideas is even wider than that of Sense and Actuality, and introduces an entirely new set of conditions. Ideas being the traces or surviving impressions of sense, everything must depend upon the forces that determine the retention or survival of what has passed out of actual or real presence.

In the first place, from the very nature of the case, whatever the actuality was, so is the ideal continuance, with difference in degree. In point of fact, the idea, while resembling its original, has certain points of inferiority that must be allowed for. Still, there is a sameness in nature or kind. In consequence, we have to pronounce, generally, that the idea of a pleasure is pleasant and the idea of a pain painful. To multiply pleasurable ideas, and to increase their representative intensity, must be accounted one of the modes of generating pleasure; and so with pain.

Secondly. The cessation of a pain as such we have found to be, in point of fact, a source of pleasure, sometimes of a considerable amount. Nevertheless, the pain must still subsist in memory, and the memory of a pain has just been assumed to be painful. We have here to solve an apparent contradiction, for which a distinction must be made among the various kinds of pleasure and pain.[1]

[1] The recollection of a pain is necessarily of a *mixed* character. It may be painful, or it may be pleasurable, or it may be both by turns; the pre-

It is in regard to the physical pains, especially, that their cessation is not only the end of the pain, but the beginning of a pleasurable reaction : the pain is not blotted out from the memory, but the recollection of it in its painful character is completely overpowered. An acute physical pain is not really reproducible in the full strength of the actuality ; for, although we cannot forget that we have been put to pain, yet the cessation of the actual leaves us almost in the same state as if it had never been, not to speak of the pleasurable reaction that follows in certain cases. Thus the physical pains that we have passed through do not mar the enjoyment of life after the complete subsidence of the actual.

One qualifying circumstance of an important kind has yet to be stated. The memory of a pain is very efficient as a motive to the will in the prospect of recurrence. The energy of precaution inspired by recollection alone is not much less powerful than under the actual endurance; although circumstances may affect the degree of this energy. Thus, for the purposes of the will, memory is more nearly on an equal footing with actuality ; mere retrospect we may treat as of small account, prospect is very formidable.

When, from the sense pleasures and pains, we pass to those compounded of emotion and intellect, we find the character of the survival to be greatly altered. The pleasures and pains of Affection, Malevolence, Egotism, and the various Artistic Feelings, do not pass out of being by mere cessation in the same way. Their memory, while also operative upon the will, has a more important standing in the whole life. To have had an acute attack of neuralgia or other painful ailment, if there is no fear of recurrence, is not a source of permanent depression when recalled ; to have had a severe rebuff, or defeat, in some contest, is a more lasting diminution of the stock of happiness.

Reverting to the theories of pleasure and pain that have been current since the time of Aristotle, and more especially to the physical side of pleasure as concomitant with increased activity, we may consider, according to the latest views, the capability of such a theory to represent the various species of pleasure and pain. Among the most carefully elaborated and fully illustrated renderings of this view we may quote the two papers by H. R. Marshall (MIND, Nos. 63, 64). The following is a brief summary

sent mood being a ruling consideration in the case. Both the painful infliction and the pleasure of cessation are facts for recollection, and are susceptible of being revived according to circumstances. There is nothing absolute in the nature of the recuperation.

of the position maintained. "*Pleasure and Pain are determined by the relation between the energy given out and the energy received at any moment by the physical organs which determine the content of that moment; Pleasure resulting when the balance is on the side of the energy given out, and Pain when the balance is on the side of the energy received. Where the amounts received and given are equal, then we have the state of Indifference.*"

On this statement I would submit the following critical observations:—

(1) Among the cases most fully met by this view, I may refer first to the pleasures of muscular activity, and the corresponding pains of muscular fatigue. There is no difficulty in supposing that the nourished condition of the muscles, coupled with their natural vigour in the individual at the time, strictly determines the intensity of the pleasure accompanying muscular exercise. It would be inconsistent with our conscious experience, as well as improbable on physiological grounds, to take up any other position. In the course of every muscular effort sufficiently persisted in, there is a gradual diminution of the pleasure, until we reach first indifference, and then the beginnings of pain.

When the activity is not muscular but nervous, as in our purely intellectual processes, the principle seems equally justified, notwithstanding complications growing out of the deeper processes of the mind. The general fact may be maintained, not simply in the contrasts of pleasure, indifference and pain, but in the exact concomitance of amount or degree.

In so far as muscular and nervous energies enter into any of the higher processes of the mind—productive work or emotional expenditure—the law may be presumed to be strictly applicable.

(2) It is very natural to include under the same general statement the wide-ranging property of our constitution, fully recognised by mankind in every age, the law of dependence of pleasure upon remission or change of stimulus. Remission of stimulus is obviously a part of the cases just supposed, namely, muscular and nervous expenditure; for, without remission, there could be no recuperation of the tissues involved. In the more vigorous constitutions there is a copious expenditure, with comparatively little need of repose, and according to the general statement under consideration, the pleasure would be in full accord with restoration of the vigour of the tissue, however short might be the interval requisite. The time of remission has no other significance than as a condition of the nourishment of the organs concerned.

Nevertheless, the law of cessation and change of stimulus, as culminating in the well-known pleasures of novelty, does not exactly coincide with the formula as thus explained. Interval of time according to this farther principle has an *absolute value*, and is not simply relative to nourishment of tissue. A week's confinement, with privation of all muscular exercise, would impart

a peculiar zest or relish to the resumption of the usual activities, while, in point of fact, the muscular organs would be in a far worse condition than if they had been put through their accustomed daily exercise. When General Wolseley disembarked in Egypt, with an expeditionary force, he found his operations retarded by the inability of the horses to gallop; yet we may be quite sure that their enjoyment of the free use of their limbs was much greater than their ordinary delight in their daily exercise.

There is no necessary contradiction or contrariety between the law of change for the sake of change and the law of expenditure of renewed vigour. Nevertheless, the statement of the one needs to be supplemented, or somehow modified, to include the other. Only by an independent induction could we ascertain that the pleasure of a stimulus follows, in the first place, the nourishment of the organ, and in the second place the interval of remission. The two facts are distinct in their nature, and each needs to be studied on its own ground, and not to be inferred from the known workings of the other. An organ is at its very best, in point of preparation for activity, by being exercised, up to the proper limits, without the loss of a single day, as in the training of pedestrians, mountain-climbers, boxers, or athletes. The high physical condition thus gradually engendered yields its due amount of the pleasure of exercise; but, to obtain the other pleasure, there must be longer periods of remission even at the cost of inferior vigour in resuming the exertion.

The same line of observations may be taken in regard to the more purely nervous and mental activities. To keep up the intellectual energies to their highest efficiency, they need to be maintained in steady exercise, with due observance of the limits of over-fatigue. To gain the pleasures of freshness in any one mode of effort, there needs to be a much greater remission than is implied in their daily repose; and when that larger remission is allowed, as in school vacations, it is found that the renewed zest is accompanied with temporary falling off in efficiency.

(3) The doctrine under discussion is less felicitously applicable, when we survey as above the pleasures and pains of Sensation, in its more passive modes. Even such a simple case as an acute physical smart, although nowise inconsistent with the doctrine, does not easily lend itself to that mode of statement. The theory of pain, on the hypothesis in question, is, that an organ is subjected to a stimulus after it has not merely lost surplus vigour, but has got into an impoverished or deteriorated state, and so demands a period of reparation corresponding to the loss. Now, if we suppose the nerves and organ of taste to be in a perfectly replenished condition, such as to respond, with the highest relish, to something sweet, the application of the principle would be consistently made by the gradual decay of the pleasure of sweetness, until it was as good as totally lost. But going back to the primary supposition of freshness in the organ, and ad-

ministering a very slight portion of something bitter, there comes a pain at once, notwithstanding the robust condition of the organ. It has always been found extremely embarrassing to represent this phenomenon in terms of the theory before us; while any forced endeavour to so express it, is felt to give us no manner of satisfaction in conceiving the phenomenon. In the case of a sensation positively injurious to the nerve tissue, as a prick or a scald of the skin, or an inflammatory sore, we might regard it as an extreme case of deterioration of an organ by excessive and protracted stimulus. Yet the situation is so different, that the more natural course seems to be to regard destruction of a sensitive tissue, involving injury to a nerve, as a specific adjunct and occasion of acute pain. The two different cases are perfectly compatible and congruous, although neither can be stated advantageously in terms of the other.

(4) It must be freely granted that a good condition of the organs generally is an underlying advantage in all kinds of nerve stimulus that use up force. This is denied only by the very small number of theorists that would disconnect the mental with the physical at certain points, so as to uphold the position of the absolute immateriality of the mind. The doctrine thus very generally stated has its practical importance in requiring due attention to be paid to the nourishment of the bodily system, and its exemption from causes of deterioration, with a view to mental efficiency. Of such efficiency, one important region is the maintenance of the pleasurable tone under all circumstances. Nevertheless, the anomalies and exceptions already recited reduce the specific value of the principle in a very serious degree. It is only necessary to recall the wide region of stimulants, in the shape of drugs, to show the necessity of qualifying the literal statement of the doctrine we are discussing. It is too notorious that such stimulants retain their pleasurable efficacy long after the nerves affected have sunk below par and are about to commence a reaction of pain on the way to recovery. This means a giving out of nervous strength to the pitch of total bankruptcy of the tissue; and although there is no inconsistency, on the contrary a certain congruity, with the principle before us, the fact itself must be embodied in a supplemental law of Credit, in order to eke out the theory of physical hedonics.

Another class of examples of a still more anomalous kind may be recalled from the previous exposition. As if to meet with a flat denial the statement of the law of pleasure and pain given by Kant, namely, pleasure the furtherance, and pain the hindrance, of vital action, we have the cases of sweetness and relish that are positively injurious, of bitter drugs operating as tonics, of cold in painful degrees tending to invigorate the system, of agreeable warmth tending to debility. The contradiction may not be so absolute as it seems; it merely shows the necessity of one more limitation to the principle we are considering.

(5) With regard to the applications of the theory to Fine Art, a preparatory survey of the elements of Art may be of service. In the first place, Art includes a number of pleasurable sensations of the two higher senses, sight and hearing. Secondly, it embraces both higher and lower senses when taken in idea. Thirdly, it requires a selection and purification of all such pleasures, not only with a view to omitting pains, but in order to attain a certain elevation in the shape of freedom from grossness. Fourthly, the strong elementary emotions are invoked to the full length of their pleasure-giving character, with the same purifying conditions as in the senses. Fifthly, the multiplication, variation, and alternation of pleasurable modes, with avoidance of incongruity or harsh transitions, come within the aims of the artist in all departments. After allowance for all these sources of pleasurable stimulation, we come at last to a something specific and peculiar, the characteristic of Art in itself as distinguished from the senses and the emotions in their own character. The general designation HARMONY is appropriated to this class of effects. It is still sufficiently wide-ranging when we follow it into all the known departments of fine art. Recurring to what has already been advanced on this subject, we came to the conclusion that in Harmony there is a case of economising nervous power as used for pleasure-giving, and a consequent possibility of heightening a pleasurable response. So far, there is a consistency with the general maxim now before us. It is when we come to consider the extraordinary increase of pleasurable intensity due to minute adjustments of the combining elements in a work of Art, that we seem to be in a totally distinct region of mental production, which, though in no respect contradicting the present law, needs the aid of an entirely new assumption to give it hypothetical shape.

The peculiar case of rhythm in Music has been subjected to much discussion, but without any convincing result. The striking out of similarities, in the midst of dissimilarities, is partly intelligible on the principle just stated, while its higher felicities appear beyond the reach of such an explanation. The intolerable pain of the very harsh discords has no special connexion with nervous exhaustion, being the same under the highest possible vigour of the nervous tone. An inscrutable variety of molecular nerve action is set up by such discords, the obverse of some other mode belonging to the delicate varieties of concord. There is here a repetition of what occurs in the primary pains and pleasures of the special senses, and especially those whose action is chemical, and we are still without a clue to their hypothetical rendering.

(6) In the general formula of pleasure and pain, as applied to its most favourable cases, there is a numerical relation between intensity of stimulus and intensity of the resulting pleasure or pain. Nevertheless, even in our most elementary modes of

sensation, this is singularly reversed. Take the cases of tickling by the slightest conceivable contact on the skin, for which there is as yet no plausible explanation. On the other hand, the embrace of living beings, as in the mother and offspring, has a mysterious intensity of diffused thrill that seems to follow no law but its own. That there are associations engendered in this particular situation, and cumulative effects of heredity, may be allowed, yet the influence is still unique and not an example of the law in question, beyond the general propriety of a certain well-to-do condition of the system in order to maintain the thrill.

(7) A theory of pleasure and pain is wanting if it does not somehow introduce us to the very great variety of modes of both the one and the other. The science of the human mind is incomplete, so long as it fails to classify our hedonic states according to the closeness of their similarity. The division of our susceptibilities according to our known sense organs is one obvious mode of effecting such a classification. To this should follow, if possible, some theory connecting the several species with their sense foundations, and accounting for the distinctive workings of both pleasure and pain. The theory that we are engaged in discussing does go some way to meet this want, but leaves a very large region untouched and inexplicable. I doubt whether it covers one-third of the ground. As regards the higher emotions, it may be pressed into the service in accounting for the depression of Fear, but not for the intense enjoyments and severe pains allied with the Amicable and the Malevolent modes.

## II.—THE CHANGES OF METHOD IN HEGEL'S DIALECTIC. (II.)

By J. Ellis McTaggart.

The conclusion at which we arrived at the end of the first part of this article—namely, that the dialectic, even if we assume its validity, does not completely and perfectly express the nature of thought—is startling and paradoxical. For the validity of the dialectic method at all, and its power of adequately expressing the ultimate nature of thought, are so closely bound up together, that they may well appear at first sight to be inseparable. The dialectic process is a distinctively Hegelian idea. Doubtless the germs of it are to be found in Fichte and others; but it was only by Hegel that it was fully worked out and made the central point of a philosophy. And in so far as it has been held since, it has been held substantially in the manner in which he stated it. To retain the doctrine, and to retain the idea that it is of cardinal importance while denying that it adequately represents the nature of thought, appears to be a most unwarranted and gratuitous choice between ideas which their author held to be inseparable.

Yet I cannot see what alternative is left to us. For it is Hegel himself who refutes his own doctrine. The state to which the dialectic, according to him, gradually approximates is one in which the terms thesis, antithesis, and synthesis can have no meaning. For in this state there is no opposition to create the relation of thesis and antithesis, and, therefore, no reconciliation of that opposition to create a synthesis. "Whatever is distinguished is without more ado and at the same time declared to be identical, one with another, and with the whole." "The antithesis which the Motion lays down is no real antithesis." (*Enc.* section 161.) Now, nowhere in the dialectic do we entirely get rid of the relation of thesis, antithesis, and synthesis, not even in the final triad of the process. The inference seems inevitable that the dialectic cannot fully represent, in any part of its movement, the real and essential nature of pure thought. The only thing to be done is to consider whether, with this all-important limitation, the process has any longer any real significance, and if so, how much.

Since the dialectic does, if the hypothesis I have advanced

be correct, represent the inevitable course our minds are logically bound to follow, when they attempt to deal with pure thought, while it does not adequately represent the nature of pure thought itself, it follows that it must be in some degree subjective. We have now to determine exactly the meaning to be applied to this rather ambiguous word in this connexion. On the one hand, it is clear that it is not subjective in the sense in which the word has been defined as meaning "that which is mine *or* yours". It is no mere empirical description or generalisation. For whatever we may hold with regard to the success or failure of the dialectic in apprehending the true nature of thought will not at all affect the question of its internal necessity and of its cogency for us. The dialectic is not an account of what men have thought or may think. It is a demonstration of what they must think, provided they wish to deal with Hegel's problem at all, and to deal with it consistently and truly.

On the other hand, we must now pronounce the dialectic process to be subjective in this sense—that it does not fully express the essential nature of thought, but obscures it more or less under particulars which are not essential. It may not seem very clear at first sight how we can distinguish between the necessary course of the mind when engaged in pure thought, which the dialectic method, according to this hypothesis, is admitted to be, and the essential nature of thought, which it is not allowed that it can express. What, it may be asked, is the essential nature of thought, except that course which it must and does take, whenever we think?

We must remember, however, that according to Hegel thought can only exist in its complete and concrete form—that is, as the Absolute Idea. The import of our thought may be, and of course often is, a judgment under some lower category, but our thought itself, as an existent fact, distinguished from the meaning it conveys, must be concrete and complete. For to stop at any category short of the complete whole involves a contradiction, and a contradiction is a sign of error. Now our judgments can be erroneous and often are, and so we can, and do, make judgments which involve a contradiction. But there is no intelligible meaning in saying that a fact is erroneous, and therefore, if we find a contradiction in any judgment, we know that it cannot be true of facts. It follows that, though it is unquestionably true that we can predicate *in* thought categories other than the highest, and even treat them as final, it is no less

certain that we cannot truly predicate *of* thought, any more than of any other reality, any category but the Absolute Idea.

This explains how it is possible for the actual and inevitable course of thought not to express fully and adequately its own nature. For thought may be erroneous or deceptive, when it is treating of thought, as much as when it is treating of any other reality. And it is possible that under certain circumstances the judgment expressed in our thoughts may be inevitably erroneous or deceptive. If these judgments have thought as their subject-matter we shall then have the position in question—that the necessary course of thought will fail to express properly its own nature.

It is, of course, the fact that we should never know that a particular judgment had expressed inadequately the nature of thought unless some other judgment afterwards corrected it, and enabled us to see where the mistake lay. It would be, therefore, meaningless to say that our judgments were always necessarily inadequate to the nature of thought. For if it were so, we could never find it out. But it is quite possible that, under given circumstances, our judgments may be inadequate to the nature of thought, and that we may detect this inadequacy by means of other judgments made under more favourable circumstances. And this is what I maintain with regard to the dialectic. When we are engaged in actually making the transitions from category to category, we are compelled to regard the process in a way which we afterwards see to be only partially correct, when, from the knowledge gained by the completion of the whole logic, we look back, and consider what is involved in its existing at all.

The mistake, as we have already noticed, consists in the fact that whereas the true process,—which forms the essence of the actual process in time, and which alone is preserved and summed up in the Absolute Idea,—is a direct process from one term which exists only in the transition to another, the actual process, on the other hand, is one from contradictory to contradictory, each of which is conceived as possessing some stability and independence. The reason of this mistake lies in the nature of the process, as one from error to truth. For while error remains in our conclusions, it must naturally affect our comprehension of the logical relations by which those conclusions are connected, and induce us to suppose them other than they are. In particular, it may be traced to the circumstance that the dialectic starts with the knowledge of the part, and from this works up to the knowledge of the whole. This method of procedure is

always inappropriate in anything of the nature of an organism. Now the reality denoted by the Absolute Idea is more than an organism. The Absolute Idea contains within itself the idea of organism, and transcends and completes it. The form of combination in the Absolute Idea is even more intimate and close than that of organism,—one in which the parts are still more indivisibly and essentially related to the whole. And here, therefore, even more than with organisms, will it be an inadequate and deceptive attempt if we endeavour to comprehend the whole from the stand-point of the part. And this is what the dialectic, as it progresses, must necessarily do. Consequently, not only are the lower categories of the dialectic inadequate except as mere moments of the Absolute Idea, but their relation to each other is not the relation which they have in the Absolute Idea, and consequently in all existence. These relations, in the dialectic, represent more or less the error through which the human mind is gradually attaining to the truth. They do not adequately represent the relations existing in the truth itself. To this extent, then, the dialectic is subjective.

9. And the dialectic is also to be called subjective because it not only fails to show clearly the true nature of thought, but, as we remarked above, does not fully express its own meaning—the meaning of the process forwards. For the real meaning of the advance, if it is to have any objective reality at all, if it is to be a necessary consequence of all attempts at deep and consistent thinking, must be the result of the nature of thought as it exists. Our several judgments on the nature of thought have not in themselves any power of leading us on from one of them to another. It is the relation of these judgments to the concrete whole of thought, incarnate in our minds and in all our experience, which creates the dialectic movement. Since this is so, it would seem that the real heart and kernel of the process is the movement of abstractions to rejoin the whole from which they have been separated, and that the essential part of this movement is that by which we are carried from the more abstract to the more concrete. This will be determined by the relations in which the finite categories stand to the concrete idea, when they are viewed as abstractions from it and aspects of it—the only sense in which they really exist. But the true relation of the abstractions to the concrete idea is, as we have already seen, that to which the dialectic method gradually approximates, but which it never reaches, and not that which it starts with and gradually, but never

entirely, discards. And so the dialectic advance has, mixed up with it, elements which do not really belong to the advance, nor to the essence of pure thought, but are merely due to our original ignorance about the latter, of which we only gradually get rid. For all that part of the actual advance in the dialectic, which is different from the advance according to the type characteristic of the Notion, has no share in the real meaning and value of the process, since it does not contribute to what alone makes that meaning and value, the restoration of the full and complete idea. What this element is we can learn by comparing the movement of the dialectic which is typical of Being with that which is typical of the Notion. It is the element of opposition and contradiction, the element of immediacy in the finite categories, and the negation by them of their antitheses, and (until forced, so to speak, into submission) of their syntheses. It is, so to speak, the transverse motion as opposed to the forward motion. The dialectic always moves onwards at an angle to the straight line which denotes advance in truth and concreteness. Starting unduly on one side of the truth, it oscillates to the other, and then corrects itself. Once more it finds that even in its corrected statement it is still one-sided, and again swings to the opposite extreme. It is in this indirect way alone that it advances. And the essence of the process is the advance alone. The whole point of the dialectic is its gradual attainment to the Absolute Idea. In so far, then, as the process is not direct advance to the absolute, it does not express the essence of the process only, but also the inevitable inadequacies of the human mind when considering a subject-matter which can only be fully understood when the consideration has been completed.

And, as was remarked above, it also fails to express its own meaning in another way. For the imperfect type of transition, which is never fully eliminated, represents the various categories as possessing some degree of independence and self-subsistence. If they really possessed this, they could not be completely absorbed in the syntheses, and the dialectic could not be successful. The fact that it is successful proves that it has not given a completely correct account of itself, and, for this reason also, it deserves to be called subjective, since it does not fully express the objective reality of thought.

Moreover, the method in the higher categories is described as making explicit that which was implicit lower down. Now the distinction between explicit and implicit is only that between what is completely and what is incompletely

understood. The peculiarities of the method in the lower categories, therefore, must be due to the subject being as yet not fully understood. This defect cannot attach to finite categories as moments of the Absolute Idea, for as such, being seen in the light of the whole, they must be fully understood. And the Absolute Idea, according to Hegel, is completely true, and adequate to express reality, and its composition cannot, therefore, be in any way due to our want of comprehension. Now, as we have seen, the essential part of the dialectic process depends on the relation of the finite categories to the Absolute Idea. The characteristics of method from which the dialectic gradually works itself free are, therefore, to be looked on only as necessary confusions of the human mind in beginning its investigations of the nature of pure thought. And as the dialectic never quite shakes itself free from these characteristics, it always retains some amount of the confusion, and can never, therefore, perfectly represent the true nature of thought.

10. Having decided that the dialectic is to this extent subjective, we have to consider how far this will reduce its cardinal significance in philosophy, or its practical importance. I do not see that it need do either. For all that results from this new position is that the dialectic is a process through error to truth. Now we knew this before. For on any theory of the dialectic it remains true that it sets out with inadequate ideas of the universe, and finally reaches adequate ideas. We now go further and say that the relation of these inadequate ideas to one another does not completely correspond to anything in the nature of things. But the general position is the same as before, that we gain the truth in the dialectic, but that the steps by which we reach it contain mistakes. We shall see that there is no essential difference between them in this respect if we consider in more detail in what the importance of the dialectic lies.

This importance is threefold. The first branch of it depends chiefly on the end being reached, and the second two chiefly on the means by which it is reached. The first of these lies in the conclusion that if we can predicate any category whatever of a thing, we are thereby entitled to predicate the Absolute Idea of it. Now we can predicate some category of everything whatever, and the Absolute Idea is simply the description in abstract terms of the human reason, or, in other words, the human spirit is the incarnation of the Absolute Idea. From this it follows that the mind could, if it only saw clearly enough, see itself in every-

thing. The importance of this conclusion is obvious. It gives the assurance of that harmony between ourselves and the world for which philosophy always seeks, and by which alone science, morality, and religion can be ultimately justified.

Hegel was entitled, on his own premises, to reach this conclusion by means of the dialectic. And the different view of the relation of the dialectic to reality, which I have ventured to put forward, does not at all affect the validity of the dialectic for this purpose. For the progress of the dialectic remains as necessary as before. The progress is indirect, and we have come to the conclusion that the indirectness of the advance is not in any way due to the essential nature of pure thought, but entirely to our own imperfect understanding of that nature. But the whole process is still necessary, and the direct advance is still essential. And all that we want to know is that the direct advance is necessary. We are only interested, for this particular purpose, in proving that from any possible stand-point we are bound in logical consistency to advance to the Absolute Idea. In this connexion it is not of the least importance what is the nature of the road we travel, provided that we must travel it, nor whether the steps express truth fully, provided that the final conclusion does so. Now the theory of the subjectivity of the dialectic process leaves the objectivity and adequacy of the result of the dialectic unimpaired. And therefore for this function the system is as well adapted as it ever was.

11. The second ground of the importance of the Hegelian logic consists in the information which it is able to give us about the world as it is here and now for us, who have not yet been able so clearly to interpret all phenomena as only to find our own most fundamental nature manifesting itself in them. As we see that certain categories are superior in concreteness and truth to others, since they come later in the chain and have transcended the meaning of their predecessors, we are able to say that certain methods of regarding the universe are more correct and significant than others. We are able to see that the idea of organism, for example, is a more fundamental explanation than the idea of causality, and one which we should prefer whenever we can apply it to the matter in hand.

Here also the value of the dialectic remains unimpaired. For whether it does or does not express the true nature of thought with complete correctness; it certainly, according to this theory, does show the necessary and inevitable con-

nexion of our finite judgments with one another. The utility which we are now considering lies in the guide which the dialectic can give us to the relative validity and usefulness of these finite judgments. For it is only necessary to know their relations to one another, and to know that as the series goes further, it goes nearer to the truth. Both these things can be learnt from the dialectic. That it does not tell us the exact relations which subsist in reality is unimportant. For we are not here judging reality, but our own judgments about reality.

The third function of the dialectic process is certainly destroyed by the view of it as subjective which I have expressed. For Hegel the dialectic showed the relation of the categories to one another as moments in the Absolute Idea, and in reality. We are now forced to consider those moments as related in a way which is inadequately expressed by the relation of the categories to one another. We are not however deprived of anything essential to the completeness of the system by this. In the first place, we are still able to understand completely and adequately what the Absolute Idea is. For although one definition was given of it by which it was simply the whole series of the categories gathered into a whole, yet a more direct and independent one may also be found, by which it is described as "the notion of the idea to which the idea itself is the object"—as the mind which recognises itself in all things. Our inability to regard the process any longer as an adequate analysis of the Absolute Idea will not leave us in ignorance of what the Absolute Idea really is.

And, in the second place, we are not altogether left in the dark even as regards the analysis of the Absolute Idea. The dialectic, it is true, never fully reveals the true nature of thought which forms its secret spring, but it gives us data by which we can discount the necessary error. For the connexion of the categories resembles the true nature of thought (which is expressed in the typical transition of the Notion), more and more closely as it goes on, and at the end of the logic it differs from it only infinitesimally. By observing the type to which the dialectic method approximates throughout its course, we are thus enabled to tell what element in it is that which is due to the essential nature of thought. It is that element which is alone left when, in the typical movement of the Notion, we see how the dialectic would act if it could act with full self-consciousness. It is true that in the lower categories we can never see the transition according to this type, owing to the necessary con-

fusion of the subject-matter in so low a stage, which hides the true nature of the process to which the dialectic endeavours to approximate. But we can regard the movement of all the categories as compounded, in different proportions according to their position, of two forces, the force of opposition and negation, and the force of advance and completion, and we can say that the latter is due to the real nature of the advancing dialectical thought and the former to our misconceptions about it. In other words, the amount of error in the dialectic is inevitable, but it can be ascertained, and need not therefore introduce any doubt or scepticism into the conclusions to which the dialectic may lead us.

12. What then is this real and essential element in the advance of thought which is revealed, though never completely, in the dialectic? In the first place, it is an advance which is direct. The element of indirectness which is introduced by the movement from thesis to antithesis, from opposite to opposite, diminishes as the dialectic proceeds, and, in the ideal type, wholly dies away. In that type each category is seen to carry in itself the implication of the next beyond it, to which thought then proceeds. The lower is lower only because of the implicitness of part of its meaning; it is no longer one-sided, requiring to be corrected by an equal excess on the other side of the truth. And, therefore, no idea stands in an attitude of opposition to any other; there is nothing to break down, nothing to fight. All that aspect of the process belongs to our misapprehension of the relation of the abstract to the concrete. While looking up from the bottom, we may imagine the truth is only to be attained by contest, but in looking down from the top—the only true way of examining a process of this sort—we see that the contest is only due to our misunderstanding, and that the growth of thought is really direct and unopposed.

The movement of the dialectic may perhaps be compared with advantage to that of a ship tacking against the wind. If we suppose that the wind blows exactly from the point which the ship wishes to reach, and that, as the voyage continues, the sailing powers of the ship improve so that it becomes able to sail closer and closer to the wind, the analogy will be rather exact. It is impossible for the ship to reach its destination by a direct course, as the wind is precisely opposite to the line which that course would take, and in the same way it is impossible for the dialectic to move forward without the triple relation of its terms, and without some opposition between thesis and antithesis. But the only object of the ship is to proceed towards the port, as the

only object of the dialectic process is to attain to the concrete and complete idea, and the movement of the ship from side to side of its course is labour wasted, in so far as the end of the voyage is concerned, though necessarily wasted, since the movement forward would be impossible without the combination with it of a lateral movement. In the same way the advance in the dialectic is merely in the gradually increasing completeness of the ideas, and the opposition of one idea to another, and the consequent negation and contradiction do not mark any real step towards attaining the knowledge of the essential nature of thought, although they are necessary accompaniments of the process of gaining that knowledge. Again, the change in the ship's course which brings it nearer to the wind, and reduces the distance which it is necessary to travel to accomplish the journey, will correspond to the gradual subordination of the elements of negation and opposition which we have seen to take place as we approach the end of the dialectic.

13. We shall find confirmation for our view of the gradual change in the method of the dialectic, if we examine the all-including and supreme triad, of which all the others are moments. This triad is given by Hegel as Logic, Nature and Spirit.

If we inquire as to the form which the dialectic process is likely to assume here, we find ourselves in a difficulty. For the form of transition in any particular triad was determined by its place in the series. If it was among the earlier categories it approximated to the character given as typical of Being; it it did not come till near the end it showed more or less resemblance to the type of the Notion. And we were able to see that this was natural, because the later method, being more direct and less encumbered with irrelevant material, was only to be attained when the work previously done had given us sufficient insight into the real nature of the subject-matter. This principle, however, will not help us here. For the transition which we are here considering is both the first and the last of its series, and it is impossible therefore to determine its characteristic features by its place in the order. The less direct method is necessary when we are dealing with the abstract and imperfect categories with which our investigations must begin, the more direct method comes with the more adequate categories. But his triad covers the whole range, from the barest category of the Logic—that of pure Being—to the culmination of human thought in Absolute Spirit.

Since it covers the whole range in which all the types of

the dialectic method are displayed, the natural conclusion would seem to be that one of them is as appropriate to it as another, that whichever form may be used will be more or less helpful and significant, because the process does cover the ground in which that form can appropriately be used; while, on the other hand, every form will be more or less inadequate, because the process covers ground on which it cannot appropriately be used. If we cast it in the form of the Notion, we shall ignore the fact that it starts with categories too inadequate for a method so direct; if, on the other hand, we try the form of the categories of Being, the process contains material for which such a method is inadequate.

And if we look at the facts we shall find that they confirm this view, and that it is possible to state the relation of Logic, Nature, and Spirit to one another, in two different ways. Hegel himself states it in the manner characteristic of the Notion. It is not so much positive, negative, and synthesis, as universal, particular, and individual that he points out. In the Logic thought is to be found in pure abstraction from all particulars (we cannot, of course, think it as abstracted from particulars, but in the Logic we attend only to the thought, and ignore the data it connects). In Nature we find thought again, for Nature is part of experience, and more or less rational, and this implies that it has thought in it. In Nature, however, thought is rather buried under the mass of data which appear contingent and empirical; we see the reason is there, but we do not see that everything is completely rational. It is described by Hegel as the idea in a state of alienation from itself. Nature is thus far from being the mere contrary and correlative of thought. It is thought and something more, thought incarnate in the particulars of sense. At the same time, while the transition indicates an advance, it does not indicate a pure advance. For the thought is represented as more or less overpowered by the new element which has been added, and not altogether reconciled to and interpenetrating it. In going forward it has also gone to one side, and this requires, therefore, the correction which is given to it in the synthesis, when thought, in Spirit, completely masters the mass of particulars which for a time had seemed to master it, and when we perceive that the truth of the universe lies in the existence of thought as fact, the incarnation of the Absolute Idea—in short, in Spirit.

Here we meet all the characteristics of the Notion. The second term, to which we advance from the first, is to some

extent its opposite, since the particulars of sense, entirely wanting in the first, are in undue prominence in the second. But it is to a much greater extent the completion of the first, since the idea, which was taken in the Logic in unreal abstraction, is now taken as embodied in facts, which is the way it really exists. The only defect is that the embodiment is not yet quite complete and evident. And the synthesis which removes this defect does not, as in earlier types of the dialectic, stand impartially between thesis and antithesis, each as defective as the other, but only completes the process already begun in the antithesis. It is not necessary to compare the two lower terms, Logic and Nature, to be able to proceed to Spirit. The consideration of Nature alone would be sufficient to show that it postulated the existence of Spirit. For we have already in Nature both the sides required for the synthesis, though their connexion is so far imperfect, and there is consequently no need to refer back to the thesis, whose meaning has been incorporated and preserved in the antithesis. The existence of the two sides, not completely reconciled, in the antithesis, in itself postulates a synthesis, in which the reconciliation shall be completed.

14. But it would also be possible to state the transition in the form which is used in the Logic for the lower part of the dialectic. In this case we should proceed from pure thought to its simple contrary, and from the two together to a synthesis. This simple contrary will be the element which, together with thought, forms the basis for the synthesis which is given in Spirit. And as Nature, as we have seen, contains the same elements as Spirit, though less perfectly developed, we shall find this contrary of thought to be the element in experience, whether of Nature or Spirit, which cannot be reduced to thought. Now of this element we know that it is immediate and that it is particular—not in the sense in which Nature is particular, in the sense of incompletely developed individuality, but of abstract particularity. It is possible to conceive that in the long run all other characteristics of experience except these might be reduced to a consequence of thought. But however far the process of rationalisation might be carried, and however fully we might be able to answer the question of why things are as they are and not otherwise, it is impossible to get rid of a datum which is immediate and therefore unaccounted for. For thought is only mediation, and must therefore exist in conjunction with something immediate on which to act. If nothing existed but thought

itself, still the fact of its existence must be in the long run immediately given, and one for which thought itself could not account. This immediacy is the mark of the element which is essential to experience and irreducible to thought.

If then we wished to display the process from Logic to Spirit according to the Being-type of transition we should, starting from pure thought as our thesis, put as its antithesis the element of immediacy and "givenness" in experience. This element can never be properly or adequately described, since all description involves the predication of categories of the subject and is consequently mediation; but by abstracting the element of mediation in experience, as in the logic we abstract the element of immediacy, we can form some idea of what it is like. Here we shall have thought and immediacy as exactly opposite and counterbalancing elements. They are each essential to the truth, but present themselves as opposed to one another. Neither of them has the other at all as a part of itself, though by external reasoning it can be seen that one implies the other. But each of them negates the other as much as it implies it, and the relation, without the synthesis, is one of opposition and contradiction. We cannot see, as we can when a transition assumes the Notion form, that the whole meaning of the one category lies in its transition to the other. The synthesis is the notion of experience or reality, in which we have the given immediate mediated. This contains both Nature and Spirit, the former as the more imperfect stage, the latter as the more perfect, culminating in the completely satisfactory conception of Absolute Spirit. Nature stands in this case in the same relation to Absolute Spirit as do the lower forms of spirit—as forms equally concrete but less perfectly developed.

This triad could give as cogent a proof as the other. It could be shown, in the first place, that mere mediation is unmeaning except in relation to the merely immediate, since without something to mediate it could not act. In the same way it could be shown that the merely given, without any action of thought on it, could not exist, since any attempt to describe it, or even to assert its existence, involves the use of some category, and therefore of thought. And these two extremes, each of which negates the other and at the same time demands it, are reconciled in the synthesis of actual experience, whether Nature or Spirit, in which the immediate is mediated, and both extremes in this way gain for the first time reality and consistency.

The possibility of this alternative arrangement affords, as

I mentioned above, an additional argument in favour of the view that the change of method is essential to the dialectic, and that it is due to the progressively increasing insight into the subject which we gain as we pass to the higher categories and approximate to the completely adequate result. For in this instance, when the whole ground from beginning to end of the dialectic process is covered in a single triad, we find that either method may be used, which suggests of itself that the two methods are approximate to the two ends of the series which are here, and here only, united by a single step. Independently of this, however, it is also worth while to consider the possibility of the double transition attentively, because it may help us to explain the origin of some of the misapprehensions of Hegel's meaning which are by no means uncommon.

We saw above that the dialectic more closely represented the real nature of thought in the later categories, when it appeared more direct and spontaneous, than in the earlier stages, when it was still encumbered with negations and contradictions. Of the two possible methods of treating this particular transition—that which Hegel actually adopted, and that which we have just seen to be also possible—it would appear beforehand that the former would be that which would be the most expressive and significant. On inquiry we shall find that this is actually the case. For there is no real opposition between thought and immediacy; neither can exist without the other. Now, in the method adopted by Hegel, the element of immediacy comes in first in Nature, and not as an element opposed to, though necessarily connected with, the mediation of the logic, but as already bound up with it in a unity, which unity is Nature. This expresses the truth better than a method which starts by considering the two aspects as two self-centred and independent realities, which have to be connected by reasoning external to themselves. For by the latter, even where they are finally reconciled in a synthesis, it is done, so to speak, against their will, since their claims to independence are only forced from them by the *reductio ad absurdum* to which they are reduced when they are seen, as independent, to be at once mutually contradictory and mutually implied in each other. In this method the transitory nature of the incomplete categories, and their movement forward of their own essential nature, are not sufficiently emphasised.

And we shall find that the subject-matter of the transition is too advanced to bear stating according to the Being-type without showing that that type is not fully appropriate

to it. Logic and immediacy are indeed as much on a level as Being and Not-Being. There is no trace whatever in the former case, any more than in the latter, of a rudimentary synthesis in the antithesis. But the other characteristic of the lower type—that the thesis and the antithesis should claim to be mutually exclusive and independent—cannot be fully realised. Being and Not-Being, although they may be shown by reasoning to be mutually implicated, are at any rate *primâ facie* distinct and opposed. But mediation and immediacy, although opposed, are nevertheless connected, even *primâ facie*. It is impossible even to define the two terms without suggesting that each of them is, by itself, unstable, and that their only real existence is as aspects of the concrete whole in which they are united. The method is not sufficiently advanced for the matter it deals with, which compels it to modify its form.

15. It is, however, as I endeavoured to show above, *a priori* probable that neither method would fully fit this particular case. And not only the one which we have just discussed, but the one which Hegel preferred to it, will be found to some degree inadequate to its task here. The latter, no doubt, is the more correct and convenient of the two; yet its use alone, without the knowledge that it did not in this case exclude the concurrent use of the latter as equally legitimate, may lead to grave miscomprehensions of the system.

For the use of that method which Hegel does not adopt—the one in which the terms are Logic, Immediacy, and Experience—has at any rate this advantage, that it brings out the fact that Immediacy is as important and ultimate a factor in reality as Logic is, and one which is irreducible to it. The two terms are exactly on a level. In point of fact we begin with the Logic and go from that to Immediacy, because it is to the completed idea of the Logic that we come if we start from the idea of pure Being, and we naturally start from that idea, because it alone, of all our ideas, is the one whose denial carries with it at once and clearly, self-contradiction. But the transition from Immediacy to Logic is exactly the same as that from Logic to Immediacy. And as the two terms are correlative in this way, it would be comparatively easy to see, by observing them, that neither of them derived their validity from the other, but both from the synthesis.

This is not so clear when the argument takes the other form. The element of Immediacy here never appears as a separate and independent term at all. It appears in Nature for the

first time, and here it is already in combination with thought. And Nature and Logic are not correlative terms, from either of which we can proceed to the other. The transition runs from Logic to Nature—from thought by itself, to thought combined with Immediacy. It is not unnatural, therefore, to suppose that Immediacy is dependent on, and deducible from, pure thought, while the reverse process is not possible. The pure reason is supposed to make for itself the material in which it is embodied. "The logical bias of the Hegelian philosophy," says Pro. Seth, "tends . . . to reduce things to mere types or 'concretions' of abstract formulæ." (*Hegelianism and Personality*, p. 126.) It might, I think, be shown that other considerations conclusively prove this view to be incorrect. In the first place, throughout the Logic there are continual references which show that pure thought requires some material, other than itself, in which to work. And, secondly, the spring of all movement in the dialectic comes from the synthesis towards which the process is working, and not from the thesis from which the start is made. Consequently, progress from Logic to Nature could, in any case, prove, not that the additional element in nature was derived from thought, but that it co-existed with thought in the synthesis which is their goal. But although the mistake might have been avoided, even under the actual circumstances, it could scarcely have been made if the possibility of the alternative method of deduction had been known. Immediacy would, in that case, have been treated as a separate element in the process, and as one which was correlative with pure thought, so that it could scarcely have been supposed to have been dependent on it.

The more developed method, again, tends rather to obscure the full meaning and importance of the synthesis, unless we realise that in this method part of the work of the synthesis is already done in the second term. This is of great importance, because we have seen that it is in their synthesis alone that the terms gain any reality and validity, which they did not possess when considered in abstraction. In the earlier method we see clearly that pure thought is one of these abstractions, as mere immediacy is the other. It is, therefore, clear that each of these terms, taken by itself, is a mere abstraction, and could not possibly, out of its own nature, produce the other abstraction, and the reality from which they both come. From this standpoint it would be impossible to suppose that out of pure thought were produced Nature and Spirit.

Now, in the type characteristic of the Notion, the same

element appears both in thesis and antithesis, although in the latter it is in combination with a fresh element. There is, therefore, a possibility of misunderstanding the process. For an element which was both in thesis and antithesis might appear not to be merely a one-sided abstraction, but to have the concreteness which is to be found in the synthesis, since it appears in both the extremes into which the synthesis may be separated. When, for example, we have Logic, Nature, and Spirit, we might be tempted to argue that pure thought could not be only one side of the truth, since it was found in each of the lower terms—by itself in Logic, and combined with immediacy in Nature, and hence to attribute to it a greater self-sufficiency and importance than it really possesses.

This mistake will disappear when we realise that the only reason that pure thought appears again in the second term of the triad is that the synthesis, in transitions of this type, has already begun in the antithesis. It is only in the synthesis that thought appears in union with its opposite, and, apart from the synthesis, it is as incomplete and unsubstantial as is immediacy.

But the change in the type of the process is not sufficiently emphasised in Hegel, and there is a tendency on the part of observers to take the type presented by the earliest categories as that which prevails all through the dialectic. And as, in the earlier type, one of the extremes could not have been found in both the first and second terms of a triad, it is supposed that pure thought cannot be such an extreme, cannot stand in the same relation to Spirit, as Being does to Becoming, and is rather to be looked on as the cause of what follows it than as an abstraction from it.

16. I have endeavoured to show that the view of the dialectic given in this paper, while we cannot suppose it to have been held by Hegel, is, nevertheless, not unconnected with his system. The germs of it are to be found in his exposition of the change of method in the three great divisions of the process, and the observation of the details of the system confirm this. But it was not sufficiently emphasised, nor did Hegel draw from it the consequences, particularly as regards the subjective nature of the dialectic, which I have tried to show logically result from it.

But there is, nevertheless, justification for our regarding this theory as a development and not a contradiction of the Hegelian system, since some such view is really a condition of the existence of any dialectic system at all. And we have seen that it will affect neither of the great objects which

Absolute Idealism claims to have accomplished—the demonstration that the real is rational and the rational is real, and the classification, according to their necessary relations and intrinsic value, of the various categories which we use in ordinary and finite thought.

Many other questions might be raised, and indeed must be raised before even the formal validity of the Hegelian system could be finally determined. Perhaps the most important of these is the relation of the dialectic process to the movement of time. How far Hegel regarded the Absolute Idea as already realised and how far only as an ideal, how the fundamental rationality of the universe is related to the obvious imperfections, either in the world or our judgments about it, which exist round us, and what amount of objective or subjective reality can be ascribed to the incomplete dialectic process—these are points of vital importance. Not less important is the consideration of the nature of the Absolute Spirit which gives reality to the whole process, and which is treated by Hegel in a manner which would require careful criticism. But with these points it is impossible for me to deal here.

The dialectic system is not so wonderful or mystic as it has been represented to be. It makes no attempt to deduce existence from essence; it does not even attempt to eliminate the element of immediacy in experience, and to produce a self-sufficient and self-mediating thought. It cannot even, if the view I have taken is right, claim that its course is a perfect mirror of the nature of reality. But although the results which it attains are comparatively commonplace, they go as far as we can for any practical purpose desire. For, if we accept the system, we learn from it that in the universe is realised the whole of reason, and nothing but reason. Contingency, in that sense in which it is baffling and oppressive to our minds, has disappeared. For it would be possible, according to this theory, to prove that the only contingent thing about the universe was its existence as a whole, and this is not contingent in the ordinary sense of the word. Hegel's philosophy is thus capable of satisfying the needs, theoretical and practical, to satisfy which philosophy originally arose, nor is there any reason to suppose that he ever wished it to do more.

# III.—THE LEIPSIC SCHOOL OF EXPERIMENTAL PSYCHOLOGY.

By E. Bradford Titchener.

The object of this article is to give a general survey of the researches carried out in Wundt's Institute, and of the other psychological contents of the *Philosophische Studien*, from the date of Prof. Cattell's paper on "The Psychological Laboratory at Leipsic" to the present time. The material with which Prof. Cattell had to deal was classified by him as convenience dictated.[1] It has seemed to me more suitable to follow the divisions of the *Physiologische Psychologie*, and to employ Wundt's terminology throughout. I have aimed, so far as space allows, at giving a critical rather than a merely descriptive account of the various researches under notice; although many of the questions at issue are too complicated to be adequately dealt with in any other way than by an independent discussion.

I. *The Physical Basis of Mental Life.* The counter-criticism of Prof. H. Munk's views upon cerebral localisation and specific nerve-energy, with which Wundt opens the sixth volume of the *Studien*, is interesting both as containing the latter's last word upon the two questions, and as showing how dangerous it is for a 'pure' physiologist to meddle in psychology.[2] According to Prof. Munk, each sense-centre is, on the one hand, a projection-sphere for the peripheral excitations of the sense-organ, and, on the other, a store-house of memorial representations of such excitations. Hence the distinction, *e.g.*, between "cortical" and "mental" blindness. Wundt points out that the psychology of the latter supposition is worthy of a believer in the 'faculties' of the phrenologists. He notices the gradual approximation of the extreme schools—of Hitzig and Luciani on the one side, and of the followers of Flourens on the other; and repeats his conviction that facts and not hypotheses are the present desiderata.

[1] Mind, xiii. pp. 37-51.

[2] "Zur Frage der Localisation der Grosshirnfunctionen," *Phil. Stud.* vi. pp. 1-25. *Phys. Psych.* (3te Aufl.) ii. pp. 218 ff., 332 ff. H. Munk, "Ueber die centralen Organe für das Sehen und das Hören bei den Wirbelthieren," *Sitzungsbericht der kgl. Preuss. Academie der Wissenschaften*, June 20, 1889.

The doctrine of specific energies, as expounded by J. Müller and Helmholtz, had been opposed by Wundt mainly on two grounds: (1) that in the absence of a particular sense-organ the existence of sensations of that sense had never been observed; and (2) that the assumption of specific energies presupposes a theory of the constancy of organic forms. After restating these arguments at some length, he gives a clear account of his own view—that the central nervous elements were to begin with functionally indifferent, and only gradually acquired a special function owing to internal molecular changes caused by their peripheral connexions. The taking on of vicarious function is then an adaptation to a new set of functional conditions; its range of possibility becoming increasingly limited with increasing complication of brain-structure.

II. *Sensation.* (*a*) *Intensity.* The most noteworthy feature of Prof. Kraepelin's article on psycho-physical method is his condemnation of the method of right and wrong cases in its present form. The difficulty which the judgments "equal" and "doubtful" present to the application of mathematical formulæ to experimental results gained by this method has occupied psycho-physicists from the beginning. Fechner at first halved the offending judgments; and thus, from the equation $r + f + z = n$, obtained $r^1 + f^1 = n$ (where $r^1 = r + \frac{z}{2}, f^1 = f + \frac{z}{2}$); $r^1$ and $f^1$ being alone taken into account in the determination of the threshold of difference.[1] G. E. Müller uses them differently. We may regard them as belonging to a sphere of sensations (T) which lies midway between $i_1 > i$ and $i_1 < i$ ($i_1$ and $i$ being the stimuli, and the signs referring to a judgment of just perceptible sensation-difference); and may assume that a definite point of T corresponds to the ideal equality of the sensations called forth by $i_1$ and $i$—the equality gained by the distribution of $r$, $f$ and $z$. Let $S_I$ denote the portion of T which lies above this point of equality, and $S_{II}$, that which lies below it. Then, according to Müller, the $z$-cases will be uniformly distributed in T on either side of the equality-point; so that the threshold of difference[2] is $S_I = S_{II} = \frac{T}{2}$. Lorenz reckoned judgments of

[1] $r$ = right, $f$ = wrong, $z$ = doubtful and equal judgments.

[2] Wundt, following Fechner, makes $S_I$ and $S_{II}$ partial thresholds, T the total threshold. To $S_I$ corresponds the decrease of D (the stimulus-difference, $i_1 - i$) by a value equivalent to the magnitude of $S_I$; to $S_{II}$, the increase of D by a value equivalent to the magnitude of $S_{II}$.

equality, when $i_1$ and $i$ were objectively different, as $f$-cases; but Prof. Kraepelin rightly points out that the psychological moments in such a judgment are essentially different from those which characterise wrong judgments properly so-called. He himself proposes a modification of the method, which had been independently suggested by Prof. Jastrow;—the exclusion of $z$-judgments altogether. Objectively equal stimuli not being employed, the reagent is simply required to decide in each case which of the two given impressions is the stronger.

Those who have worked much with the method of right and wrong cases will, I think, be exceedingly distrustful of this innovation. The previous state of consciousness (expectation) exerts a very large influence on the judgment. I have often noticed that a stimulus-difference which lay beneath the threshold would appear considerably increased, and one which lay above it considerably diminished, if the expectation were wrongly directed before the experiment took place. It is exceedingly easy always to give the judgment "greater," even when objectively equal stimuli are employed; but the psychological conditions are essentially altered, and a constant error imported into the results, by the exclusion of $z$-cases.[1]

Starke's research on the measurement of strength of sound is a continuation of previous work. Within the limits of experimentation it was again found that the law of proportionality between intensity of sound and height of fall, where the fall-weight is constant, and between intensity of sound and fall-weight, where the height of fall is constant, is valid. Deviations from it, noticed by other observers, are explained by neglect of various sources of error.[2]

[1] Wundt, *Phys. Psych.* i. pp. 353-5; Kraepelin, "Zur Kenntniss der psycho-physischen Methoden," *P. S.* vi. 493-513; Lorenz, "Die Methode der richtigen und falschen Fälle in ihrer Anwendung auf Schallempfindungen," *P. S.* ii. pp. 430 ff.; Jastrow, "A Critique of Psycho-physical Methods," *American Journal of Psychology*, i. 277-291.

[2] The law, $i = cwh$—which is only empirically valid—has been discussed by Prof. Cattell, MIND, xiii. p. 42. Starke, "Zum Mass der Schallstärken," *P. S.* v. 157-169. *Cf.* his original article, "Die Messung von Schallstärke," *P. S.* iii. pp. 264 ff. The investigations into psycho-physical method carried out by Merkel ("Abhängigkeit zwischen Reiz und Empfindung," *P. S.* iv. 541-594, v. 245-291, 499-557) and Higier ("Experimentelle Prüfung der psycho-physischen Methoden im Bereiche des Raumsinnes der Netzhaut," *P. S.* vii. 232-297) I hope to deal with, in a future article, in connexion with Prof. Angell's work, "Untersuchungen über die Schätzung von Schallintensitäten nach der Methode der mittleren Abstufungen" (*P. S.* vii. pp. 414-468). I must also leave undiscussed here the article by C. Lorenz, "Untersuchungen ueber die Auffassung von Tondistanzen" (*P. S.* vi. 26-103), and the controversy between Wundt and

(*b*) *Quality.* Dr. Kirschmann begins his article on the sensibility to light (*Helligkeit*) in indirect vision with a record of experiments upon the functional quality of the *fovea centralis* and of the lateral parts of the retina. It was found that, while neither taken alone is at all exact, central vision surpasses lateral as regards clearness and quality of the stimulus; while lateral vision has the advantage as regards its intensity.

The objective brightness of the retinal image decreases from centre to periphery; or, in other words, the quantity of reflected light which affects the lateral parts of the retina during fixation is less than that which reaches the *fovea centralis.* One would, therefore, expect that laterally seen objects would appear less bright than those centrally seen. That this is not the case can be proved in many ways. Thus, an uniformly bright surface, the centre of which is fixated, is seen as uniformly bright. A glowing platinum-wire, just visible with direct fixation, is clearly seen in indirect vision (Aubert). Dim stars are better made out when indirectly than when directly observed. Differences in the brightness of an illuminated surface are more easily recognised in indirect vision. In the same way, the outer rings of a Masson's disc are more certainly distinguished (Helmholtz). After-images in the lateral portions of the retina are more intense, and last longer than those which result from direct stimulation.[1] A white disc, so covered with grey glasses as to be, if directly observed, just below the threshold, becomes visible if indirectly observed. The alterations undergone by laterally seen colours are not those of decrease in brightness, but rather those of increased intensity; red becomes orange; violet, blue. A rotating disc, composed of black and white sectors, which just fuses to grey for direct fixation, shows the succession of black and white when indirectly regarded: *i.e.*, the sensibility to quick movement is greater in the lateral parts of the retina than at the centre.

Dr. Kirschmann proceeded to determine the quantitative relations of sensibility to light for the different portions of the retina. He found that its increase with distance from

Stumpf which has arisen out of it (Stumpf, *Zeitschrift für Psychologie*, i. 419 ff., ii. 266 ff., 438 ff. Wundt, *P. S.* vi. 605 ff., vii. 298 ff. *Cf.* Engel, *Zeitschr. für Psych.* ii. 361 ff.). The discussion would, of course, belong to the second division of the paragraph dealing with Sensation.

[1] This point requires confirmation. If the rule is as stated, there are certainly exceptions.

the centre is far more considerable along the horizontal than along the vertical meridian; on the intermediate meridians it was more or less irregular. The upper half of the retina is more sensitive than the lower. As regards the anatomical question, he sees in the cones of the *fovea centralis* organs, whose main function is that of distinguishing; in the rods of the lateral parts, organs especially sensitive to light.

An appendix discusses the results obtained by A. E. Fick; independently of which Dr. Kirschmann had worked. The greater difference which the former observer found, between the centre and lateral portions of the retina, is to be explained by the fact that he employed the adapted (rested) eye, and just-perceptible stimulus-intensities.[1]

An investigation by the same author, into the qualitative relations of simultaneous light- and colour-contrast, is introduced by an interesting discussion of the phenomena of pseudo-contrast; of cases, *i.e.*, in which the physical conditions of illumination are the sole or partial cause of the observed effect. Such phenomena are the coloured halo, which in certain circumstances surrounds a shadow; or the greater brilliancy of green upon a red ground, as compared with red seen upon green. Coming to simultaneous contrast proper (the form of contrast which results, simultaneously with stimulation of certain parts of the retina, in other not contiguous parts which are not stimulated), Dr. Kirschmann distinguishes an intensive and extensive side of the phenomenon. Intensively, the strength of light-, colour- and saturation-contrast depends on the degree of illumination of the objects regarded; while that of colour- and saturation-contrast stands further in relation to the colour-tone and degree of saturation of the contrasting surfaces. Extensively, the strength of simultaneous contrast in general depends on their extent, and distance from one another and from the eye. The general experimental results (for which, by the way, finality is not claimed) were as follows. Simultaneous colour-contrast contains two elements,—the influence of each contrasting surface upon the other,—the quantitative relations of which vary inversely with, though not in a strict proportion to, the degree of saturation of the two colours. It is, therefore, strongest when the latter are in a state of mean saturation; with as complete exclusion of light-con-

[1] Kirschmann, "Ueber die Helligkeitsempfindung im indirecten Sehen," *P. S.* v. 447-498. Fick, "Studien ueber Licht- und Farben-empfindung," *Pflüger's Archiv*, xliii. pp. 441 ff.

trast as is possible. Simultaneous contrast between a colour and a grey of like brightness (*Helligkeit*) increases, probably in a logarithmic relation, with the saturation of the inducing colour. The intensity of simultaneous contrast in general varies inversely with the extension of the contrasting surfaces. The intensity of light- and, probably, of colour-contrast is directly proportional to the linear extension of the inducing retinal surface.[1] Of especial interest is the author's conjecture that the phenomena of colour-contrast in general are reducible to terms of light-contrast. This point he promises to discuss in a future paper.

Recognising the necessity, for the above contrast-experiments, &c., that "white" and "black" should be more than indefinite terms, Dr. Kirschmann devised an apparatus for determining their quantitative relation. He took as unit of measurement the brightness of ordinary white card; and employed for his comparison various "black" surfaces, and different methods of illumination. The same card painted with "Paris black," *e.g.*, gave a brightness of $\frac{1}{66}$, in the light of a paraffin lamp; of $\frac{1}{58}$ in gaslight; and of $\frac{1}{57}$ in diffused daylight.[2] Dr. Kirschmann has also found it possible to produce monochromatic light,—red, green, and blue,—by combinations of thin aniline-dyed gelatine plates. The discovery has proved a most useful one for many experiments in the department of physiological optics.[3] A series of careful photometrical determinations of the relative brightnesses of "light" and "dark" surfaces is made the basis of a fifth article, which deals with the importance of a correct handling of contrast in art,—principally in painting. The main body of the paper is taken up with a discussion of light-contrast; but a word is also said upon colour- and saturation-contrast, upon lustre, and upon the tone of feeling attaching to simultaneous contrast in general. The introduction deals with the three moments which influence an appreciation of a work of art: the quality of the artist's work, its position and surroundings, and the mental furniture of the spectator. The author points out and illustrates the mistakes that arise from putting knowledge into sensation. He writes throughout easily and with sound

[1] Kirschmann, "Ueber die quantitativen Verhältnisse des simultanen Helligkeits-und Farben-contrastes," *P. S.* vi. 415-492.

[2] Kirschmann, "Ein photo-metrischer Apparat zu psychophysischen Zwecken," *P. S.* v. 292-300.

[3] Kirschmann, "Ueber die Herstellung monochromatischen Lichtes," *P. S.* vi. 543-551.

optical knowledge ; but treats his subject-matter too lightly, and with insufficient regard of the mass of existing literature.[1]

Finally, there is to be noticed here Schischmánow's research on the purity of harmonic intervals. In his *Tonpsychologie*, Prof. Stumpf arranges these in the following series, according to the degree of fusion of their constituent tones : (1) octave ; (2) fifth ; (3) fourth ; (4) thirds and sixths; (5) seventh; (6) second, &c. Assuming (what is very doubtful) the persistence of this order for the corresponding intervals outside the octave, he formulates a law of tone-fusion, in a form analogous to that of Weber's law. Schischmánow, whose reagents judged of the purity of the interval from successive tuning-fork tones, obtained (within the octave) the series : (1) octave ; (2) fifth ; (3) fourth ; (4) greater sixth ; (5) greater third ; (6) lesser third; (7) second ; (8) lesser sixth ; (9) lesser seventh ; (10) greater seventh. This is evidently comparable with Stumpf's results ; the higher place occupied by the second being referable to the musical training of the reagents : since the second is an interval of very frequent occurrence. Wundt's law, that the judgment of purity depends on the coincidence of partial-tones, was thus in general confirmed. Other interesting results of Schischmánow's work are the facts that our sensibility to difference is greater for decrease of intervals than for their increase ; and that the raising of a tone is more readily perceived than its lowering.[2]

(*c*) *Tone of feeling.* Dr. Scripture's note on " Idea and

[1] Kirschmann, " Die psychologisch-æsthetische Bedeutung des Licht- und Farben-contrastes," *P. S.* vii. 362-393. Dr. Kirschmann's theory of painting is a combination of æsthetic Idealism with psychological Realism. This seems to me to represent a purely mechanical eclecticism : and, even as such, it is not consequently carried through. For if one is to take one's optical knowledge to the criticism of a picture, why not one's physical ideas in general ? The fulfilment of his ideal Dr. Kirschmann sees in the Sistine Madonna. He takes no umbrage at the sight of a woman standing on a cloud : though he is hurt if a full moon subtends a visual angle of more than half-a-degree. But, indeed, a school of art which strictly satisfied the requirements of Profs. du-Bois Reymond and Norman Lockyer would be no more than a curiosity. Art must submit to a compromise between scientific exactness and the æsthetic needs of the average man, who is neither physicist nor physiologist.

[2] Schischmánow, " Untersuchungen ueber die Empfindlichkeit des Intervallsinnes," *P. S.* v. 558-600. Stumpf, *Tonpsychologie*, ii. pp. 135, 139. Stumpf's law is $m : n. \; 2^{\times}$ (where $\times$ is a small whole number, and $m$ and $n$ vibration-rates of the component tones ; $m$ being $< n$).—The work of Schischmánow was published before the second volume of the *Tonpsychologie* appeared.

Feeling" was suggested by the outcome of certain of his experiments on Association, to be mentioned below. It was found that when, *e.g.*, a colour was presented to the reagent, the first link in the chain of reproduction was often not an idea, but a feeling. The question at once presents itself, whether feeling is, as much as idea, an independent psychical element; or whether there are in consciousness only ideas and their relations. The former alternative is that accepted, *e.g.*, by Lotze and Wundt; the latter represents the position of Herbart, Lipps, Münsterberg, that idea and feeling are inseparable sides of one and the same process. To the consideration of these views Dr. Scripture brings the following facts. A feeling was sometimes associated directly to the sense-impression, without the intermediation of an idea; sometimes the association was that of an idea possessing a strong tone of feeling; in the majority of cases an idea alone arose in consciousness. A feeling can of itself alter the train of reproduction. In nineteen cases out of every twenty-one the idea which followed the associated feeling led directly back to the sense-impression. Of this last fact more presently.

These considerations show that both of the views stated above must be modified. The former regarded feeling as an independent process. It is so, in so far as it can enter alone into the fixation-point of consciousness. The second laid it down that idea and feeling are two sides of the same process: they are rather two sides of mental life in general. Or, to combine both truths: feeling and idea are co-ordinated partial-phenomena of the train of mental processes, necessarily and always interconnected. But the degree of consciousness may vary; so that either may be apperceived separately, as well as both together: while, independently of this, either or both can influence the train of ideas. This latter fact, though correct, is not proved by Dr. Scripture's experiments. And generally confirmatory of Wundt's view as his results are, they would not by any means present an insuperable difficulty to those who hold the opposite theory. For a relation between ideas can be apperceived as easily as the ideas themselves.[1]

III. *The Formation of Ideas.* The psychophysic of sensation is unfortunately not yet so far advanced that we can hope, for some time to come, to see the foundations laid of a psychophysic of ideation. Some small beginnings have been

[1] Scripture, "Vorstellung und Gefühl. Eine experimentelle Untersuchung ueber ihren Zusammenhang," *P. S.* vi. 536-542.

made in the way of experiments upon tone-fusion (Stumpf's view and definition of which, however, undoubtedly require modification), but the science is almost as much a blank here as it is, too, in the sphere of feeling.—Two articles call for notice under this head.

By the 'apparent size' of an object is usually understood the size of the visual angle which it subtends. Dr. Martius uses the expression, not quite happily, to denote our judgment of the relative size of objects which are at different distances from the eye. Following a method of experimentation suggested by certain observations of Fechner's, he inquires what magnitude, at different distances, appears equal to a normal magnitude at a constant distance; and finds that the former increases, though very gradually, with the distance. Increase of the normal magnitude is accompanied by increase of the absolute difference between it and the magnitude which, at a given distance, appears equal to it, though it is probable that the relative difference remains approximately constant.—More experiments are wanted. The method of minimal changes was alone employed; it should be tested by that of right and wrong cases. The constancy of the relative difference between the magnitudes compared, when the distances are constant, is a tempting assumption, but one hardly established by Dr. Martius' results.

The decrease of the apparent size of an object, with increase of its distance from the eye, cannot be a function of the size of the retinal image, as the size of objects in general is. For the former decrease takes place much more slowly than the latter. Doubling the distance halves the size of the retinal image, while fivefold increase of distance in one of Dr. Martius' experiments decreased the apparent length of a rod by only one-fortieth. He further adduces a number of facts to prove that the same retinal image, projected to different distances, corresponds to space-images of different sizes, their increase being approximately proportional to the distance.

It is not clear that Dr. Martius is not here confusing a purely psychological process on the one hand with a purely physical fact on the other. In any case, the immediacy and certainty which he claims for "size-sensations" or size-ideas cannot be granted to him on the strength of this one investigation. The empiricist will still hold with Hering that the seeing of objects which are given equal in sensation as different is a secondary process. The apparent size of objects, at different distances, is the result

of a compromise, so to speak, between sense and experience.[1]

In a short paper on the definition of *Vorstellung*, Dr. Scripture argues from Wundt's standpoint that the specific character of an idea, genetically considered, is its unity; an unity consisting in cohesion and interconnexion of parts. This is, of course, to be distinguished from that unity which the idea owes to apperception, and which, therefore, does not characterise those ideas which are only perceived. The latter is the common use of the term in Wundt's psychology, and it is a pity that Dr. Scripture has found it necessary to employ the same word with a different meaning.[2]

IV. *Consciousness and the Train of Ideas.* (*a*) *Consciousness.* A common misunderstanding of Wundt's theory of apperception represents the latter as a power independent of conscious content, and acting upon it from without. A controversy with F. Schumann upon the question of the extent of consciousness is made the occasion of a definite statement as to the use of the term in the *Physiologische Psychologie*, in face of which error should hardly be able to arise in the future. Consciousness is, according to Wundt, a collective expression for all conscious content,—ideas, feelings, excitations of will, &c.,—and nothing beyond this.—It is the service of Herbart to have drawn a strict line of division between the two main characteristics of the inner experience, which Leibniz had brought together: the possibility of the renewal of past processes, and the graduation of the objects of perception in respect of clearness. Their severance led to the notion of a limit of consciousness; and so to that of its experimental determination. The first method was that of giving the momentary stimulus of a row of letters, figures, &c. But in this way it is the extent of apperception, and not that of consciousness, which is determined. An obvious improvement consists in giving two successive stimuli (alike or partly different); it being the task of the reagent to judge of their likeness or unlikeness. But the method is again unsatisfactory; for a chance direction of the attention upon some one part of the impression-complex might considerably influence the results. To avoid this, the components of the stimuli might themselves be successively presented to consciousness; and best

[1] Martius, "Ueber die scheinbare Grösse der Gegenstände und ihre Beziehung zur Grösse der Netzhautbilder," *P. S.* v. 601-617.

[2] Scripture, "Zur Definition einer Vorstellung," *P. S.* vii. 213-221. Külpe, *P. S.* v. 428.

in the form of a series of sounds. Here the controversy begins.

Wundt lays it down that we can only judge immediately of the qualitative or quantitative similarity or dissimilarity of two complex sense-presentations, when each of them has been present in consciousness as a simultaneous whole. He maintains that this is the case with serial sound-impressions; as is shown, firstly, by the almost irresistible tendency to group them rhythmically; and, secondly, by the fact that a limit is soon reached at which immediacy and certainty of judgment as to their likeness or unlikeness ceases. In the moment in which the stimulus ends, *i.e.*, its whole complex is present in consciousness. This Schumann denies, on the ground of self-observation; but, unfortunately, without giving the time-relations of his experiments. His view is, that a serial group of similar impressions can be taken up into the memory, with its number-characteristics; and that the reagent, in comparing two such groups, involuntarily reproduces the group first memorialised along with the second group; and, therefore, comes to each separate stimulus with expectation, till the whole number becomes equal to the number of stimuli in the first group. Here, therefore, it is denied that expectation persists; while Wundt finds this to be the case. It is a matter of self-observation against self-observation.

It is, however, hard to find confirmation of Schumann's view in the known laws of reproduction. If a series of similar sounds, $a, b, c, d, \ldots$ is followed by a like series, $a^1, b^1, c^1, d^1, \ldots$ why should $a^1$ call up the image of $a$ alone, apart from those of $b, c, d$? Wundt's explanation of the process of immediate comparison as depending on the accompanying feeling is probably correct; though this feeling would seem to be not merely the rhythmical feeling, but a complex,—certainly containing feelings of strain.[1]

(*b*) *Reaction-time.* Prof. Cattell, writing in 1888, declared that "the [simple] reaction is at first voluntary, but with practice the process becomes reflex, and the time shorter". The experiments of L. Lange on hearing and touch, in part published in the *Phil. Studien* of the same

[1] Wundt, "Ueber die Methoden der Messung des Bewusstseinsumfanges," *P. S.* vi. 250-260; "Zur Frage des Bewusstseinsumfanges," *P. S.* vii. 222-231. Feelings of strain accompany all acts of attention, according to Wundt's exposition in the *Phys. Psych.*; *cf.* ii. p. 240. Schumann, *Zeitschr. für Psych.* i. pp. 75 ff., ii. pp. 115 ff. *Cf.* Höffding, *Vierteljahrsschr. für wiss. Phil.* xiv. Schumann's general theory of *Erwartungsspannung* seems very questionable.

year, showed conclusively that differences in reaction-time are not to be so explained. The direction of the attention was proved to be the variable which had expressed itself in the results of different observers. All simple reactions could thus be grouped in three classes: the sensorial, in which the attention is directed exclusively upon the sense-impression; the muscular, in which it is concentrated on the reaction-movement; and intermediate forms, in which there is vacillation.

Lange was not content to state that the processes were qualitatively different, without giving some further analysis. Unfortunately, he attempted this from the side of anatomy and physiology, without testing his conclusions psychologically, as the law of psychophysical Parallelism would require. None the less, his discussion is suggestive; and must be touched on here, that the further course of theory may be understood.

The sensorial reaction, on Lange's view, may be schematised differently, according as the sense-impression is preceded or not preceded by a signal. In the former case, the apperception is active. The sense excitation, on arriving at its centre, meets with an excitation proceeding from the apperception-centre; perception and apperception are, therefore, simultaneous. In the latter case, the apperception is passive.

In the case of the muscular reaction, we must take into account the (previous) voluntary innervation of the group of muscles concerned. The excitation will then follow a reflex path from sense-organ to muscle-group, without touching the centre of apperception. In the lower reflex centre C there is laid up, in unstable equilibrium, a store of potential energy, derived (as actual energy) from the centre of innervation. This lower centre Lange places conjecturally in the cerebellum.

No theory of the muscular reaction is adequate, which does not account for its premature and false forms. The latter of these is explained by the instability of the lower centre: an excitation proceeding from an irrelevant sensory surface is sufficient to upset its equilibrium. For the former we must assume that C is in connexion with corresponding central sense areas. The excitation connected with a stimulus-idea arising in one of these might travel to C, and so produce a motor discharge before the advent of the appropriate sense-excitation.

Next in order comes Dr. Martius' investigation into the nature of the muscular reaction. The first part of this is

occupied with a criticism of the experiments published by Dr. Münsterberg in pt. i. of his *Beiträge*. Dr. Münsterberg, adopting Lange's view that the muscular reaction is a brain-reflex, seeks to show that it is applicable in the case of compound reactions (reactions involving an act of choice, &c.). Dr. Martius' results, on the other hand, point unmistakably to the conclusion that the direction of the attention upon the reaction movement has here a retarding, not an accelerating, influence upon the whole process, where there has been no previous practice on the part of the reagent; while no constant difference between sensorial and muscular times is to be found after such practice has taken place. The reaction process was felt to demand least effort if the attention was directed upon the sense-impression (word spoken), or on the co-ordination of the category with the corresponding muscle-group ("town" with "second finger," *e.g.*). This latter form,—the most natural in compound experiments, for which there has been no practice,—Dr. Martius proposes to term the "central" reaction; the adjective denoting here, as in the other two cases, the direction of the attention immediately before the experiment.

The second division of the article deals with the question whether the simple muscular reaction is a brain-reflex, as Lange supposed, or a process in which consciousness is involved. Wundt, without discussing the matter in detail, accepted the former explanation as adequate for the extreme form of the ordinary type of muscular reaction,—the reaction of a practised or "educated" observer. His reasons were, in the main, those already adduced by Lange; *i.e.*, the occurrence of premature and false reactions. Now the former of these, Dr. Martius points out, proves nothing for the reflex-theory. It is certainly itself not a reflex, for there is no sense-stimulus in the case, while it bears an exact resemblance to the true muscular form. The inference is, of course, that the latter is also no reflex. False reactions, again, tell directly against the theory; for it is most improbable that the wrong stimulus should give rise to an intended movement, without the participation of consciousness. The perception of the stimulus, which, according to Wundt, accompanies the reaction-process, is thus made essential, as it is adequate, to its explanation. Dr. Martius notes that the time required for the reaction is three times as long as that of a cord-reflex.[1]

[1] Some hypnotic reactions would seem to be really brain-reflexes. *Cf.* Onanoff, "De la perception inconsciente," *Archives de Neurologie*, Mai, 1890.

But what of the test of inner observation? Is one's impression of the simultaneity of his perception of the stimulus and response thereto trustworthy? The answer must be negative. For this impression of simultaneity can exist in cases where the attention is sensorially directed; and the evidence of the so-called complication experiments refutes it.[1] It remains, therefore, to give a positive explanation of the phenomena other than that put forward by Lange, and (with reservations) accepted by Wundt. For this, direct experimentation is necessary. A series of reactions was obtained, without previous practice, from various observers, who were required to control the research by noting down (1) the direction of their attention at the moment of reaction, and (2) their judgment of the result of each experiment and of its relative duration. Four variations of the ordinary method were employed. To do away with all possible objections, the observers were directed to react sensorially "as quickly as possible," *i.e.*, without waiting for a full and clear apperception of the sense-impression which served as stimulus. A time-difference between muscular and sensorial results showed itself from the outset.

The difference must, then, be a consequence of the difference in direction of attention, a difference in the central portion, as opposed to the centripetal and centrifugal portions, of the whole process. Alteration in the central conditions is not, however, identical with the disappearance of the central terms in the reaction series. The necessary concentration of attention upon the movement is an act of consciousness. The necessary perception of the stimulus differs from its apperception (as all perception from all apperception) only in its degree of clearness, and in the time it requires. The shortness of the muscular reaction is due (1) to the preparedness of the movement, and its consequent more rapid completion; and (2) to its earlier commencement, the stimulus-idea not needing to become clear in consciousness, and the attention not having to pass from this to the idea of movement.[2]

The third contribution to the theory of the simple reaction process is furnished by Dr. Külpe, in his articles on simul-

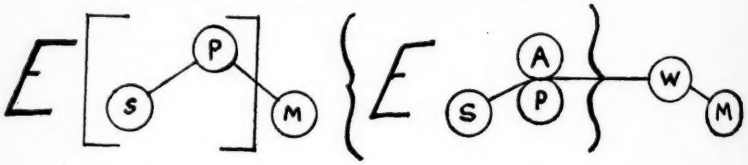
[1] *Cf.* von Tchisch, "Ueber die Zeitverhältnisse der Apperception einfacher und zusammengesetzter Vorstellungen, untersucht mit Hülfe der Complicationsmethode," *P. S.* ii. pp. 603 ff. Dwelshauvers, "Untersuchungen zur Mechanik der activen Aufmerksamkeit," *P. S.* vi. p. 247. Dr. Külpe has shown that our whole consciousness of simultaneity in co-ordinated voluntary movement is a false one, *P. S.* vi. pp. 514 ff., vii. pp. 147 ff.

[2] The variations noted in the times of muscular reaction are significant as emphasising the importance of the act of perception of the stimulus.

taneous movement. Taking Lange's results and views as his starting-point, Dr. Külpe proceeds to ask the question whether the quality of the preceding psychophysical disposition is indifferent for the time-relations of the various forms of motor response to stimulus. The first set of experiments,—which, as was to be expected, led to far wider issues than that immediately under consideration,—consisted of two-handed reactions (muscular, sensorial, prepared voluntary, and unprepared voluntary). The results were unexpected. It was found that right-handed persons did not necessarily react first with the right hand; that the numbers of first right-handed and first left-handed movements did not compensate one another in the total; that the difference between the two hand-movements varied from $0\sigma$ to $30\sigma$; that one hand, as a rule, was favoured during each series of experiments; and that the amount of deviation from simultaneity depended essentially on the nature of the reaction.

We must attempt to explain these facts, says Dr. Külpe, by a psychological theory of reaction, and not in Lange's way. The foregoing state of consciousness, consisting (qualitatively speaking) in expectation,—*i.e.*, in the apperceived idea of a more or less definite process,—is a factor of great importance. The more complete the correspondence between our expectation, and the act of movement or stimulation, the more complete is the preparation for the reaction.

The transition from any one conscious content to any other is facilitated (1) by the fact of relationship between the two, and (2) by a favourable state of feeling. In the two forms of simple reaction, the relationship is very close. The difference between them is, that in the muscular form the direction of the attention leads to fusion of the idea in expectation with the last term of the series; while in the sensorial, this fusion is that of expected phenomenon and first term. Add to this, to explain the difference in duration, the unpleasantness of prolonged expectation in relation to the muscular reaction; which gives its movement a mechanical, reflex nature. We may now schematise the processes as follows:—




Muscular Reaction. Sensorial Reaction.

E = Expectation.

Premature reactions are explicable as reactions to memorial representations of the stimulus; false reactions as being the answer to the thought "I have to react to *a* sense-impression".

To return to the experimental results. The deviations from simultaneity may be classed as constant and variable. The constant preference of one hand requires further experimental investigation; while the fact that the mean deviation is less in muscular than in sensorial reactions finds its explanation in the greater variability of the factors in the latter case. As regards the foregoing psychophysical disposition itself, it was observed that there always exists a rivalry between the determination to react simultaneously and the idea arising in consciousness from the direction of the attention.

In the second article are communicated experiments upon the constant deviations from simultaneity already referred to. A method *per exclusionem* was followed. (1) Variations of the sense-impression gave no answer to the main question. It is interesting, however, to notice that the concentration of attention is facilitated if signal and impression are (qualitatively or quantitatively) different; that the intensity and sharpness of the impression influence the reaction-time; and that the general bodily position seems to be of importance. (2) Alteration of the sensations proceeding from the organs of movement (by ether, ice, induction-shocks) gave no results. (3) Variations of the attention, on the other hand, proved to be of influence. The preference of one hand is probably to be explained by the accidental direction of the attention. Alteration in sensation is, naturally, an aid to such preference. In the sensorial reaction, less uniformity in the idea of the reaction-movement is attainable than is the case in the muscular: hence the fact that the mean variation of deviation from simultaneity in the former is higher than that in the latter form. The third part of Dr. Külpe's investigation is as yet unpublished; further experimentation having been found necessary.[1]

A second research by Dr. Martius on the length of reaction to clangs of different pitch falls under this general head. Wundt had laid it down that since no constantly different

[1] Lange, "Neue Experimente ueber den Vorgang der einfachen Reaction auf Sinneseindrücke" (i)., *P. S.* iv. 479-510. Martius, "Ueber die muskuläre Reaction und die Aufmerksamkeit," *P. S.* vi. 167-216. Külpe, "Ueber die Gleichzeitigkeit und Ungleichzeitigkeit von Bewegungen" (i)., *P. S.* vi. 414-535; (ii)., *P. S.* vii. 147-168.

effects had been obtained by qualitative variation of the stimulus, in the domain of the three senses which admitted of exact investigation (sight, hearing and touch), such differences might be considered as being too small to require consideration, in the face of other influences.[1] The experiments which Dr. Martius instituted led him, however, to the conclusion that the reaction-time to clangs lying within the six octaves $C'$ and $c''''$ decreases continuously with increase of the number of vibrations; being in the neighbourhood of $c''''$ no longer than the reaction-time to noise. The form of reaction employed was that empirically determined as the easiest: an intermediate form, in which the attention was directed exclusively on the sense-impression, but the movement followed "as quickly as possible" (*i.e.*, before its apperception).[2] This general result appeared to confirm the views of Exner, von Kries, and Auerbach, that a considerable but definite number of vibrations (about ten) is necessary for the excitation of the organ of perception. When, however, this number was calculated for various clangs, it was seen that the theory did not hold good.[3] There remained the supposition of Pfaundler and Kohlrausch that only two to five vibrations are necessary to produce a tone-sensation. Dr. Martius offers an alternative theory, based upon variations in the rapidity of the centripetal and central excitation-process, which must be assumed to differ in accordance with the different rapidity of the impulses.

The investigation, therefore, establishes the fact that the duration of the perception of tones is, within wide limits, a function of their rates of vibration. This is proved both by the continuous decrease of the reaction-time with the heightened pitch of the clangs, and by the absence of any variable, other than the vibration-rates, in the reaction-process. It is to be regretted that a larger number of experiments was not made; and that the influence of

[1] *Phys. Psych.* ii. p. 284.

[2] *Cf.* above, p. 18.

[3] Thus, for Dr. Martius himself, the numbers for C', $c'$, $c'''$ and $c''''$, instead of being approximately equal, were 2, 9, 31 and 47 respectively. The results were very different for the different observers; the increase of the number of vibrations with the height of the tone occurring only in this case.—In his latest paper, Dr. Martius admits Prof. Stumpf's objection, that these results (which are gained from a comparison of the reaction-times to noise and tone) may be invalid. He therefore attempts the calculation of the number of vibrations from intercomparison of reaction-times to tone alone. The outcome is not satisfactory; and one must reserve judgment until the point has been specially investigated.—*P. S.* vii. 484 ff.

practice was not determined. Considering the accuracy and simplicity of the method which Dr. Martius followed, one is disappointed at the scantiness of his results.[1]

In his review of this research, Prof. Stumpf takes exception to many points; and in especial raises the objection that the relative intensities of the stimulus-tones were not sufficiently taken into account and controlled. To the discussion of this point Dr. Martius devotes a third paper. Precisely formulated, the question at issue has two sides: it is—whether the absolute stimulus-threshold is lower for high than for deep tones; and whether the objective strength of the stimulus influences the time of reaction. For strength of stimulus is not to be regarded as equivalent to intensity of sensation; and the stimulus was kept constant in the experiments communicated in the first article.

Fresh experiments, in which five stimulus-intensities were employed, led to the unexpected conclusion that for a practised observer the strength of the clang had no effect on the length of reaction-time. Hitherto all observers were agreed that (within certain limits) the time of reaction decreases with increasing strength of stimulus. Wundt, judging from the mass of undifferentiated material which lay to hand, decided that the decrease was very small, so long as the form of reaction remained the same; and that a purely physiological explanation was possible. Dr. Martius' more exact experimentation proved, however, that the general proposition is not unconditionally true; that, at least for the ear, impressions of different intensity are, within wide limits, reacted upon in the same time. Neither does he assent to a physiological explanation of the lengthening of the time of response to weak impressions. Perception is here more difficult, and the co-ordination of impression and reaction-movement slower. In the neighbourhood of the threshold it is probable that no amount of practice or concentration can overcome these influences.[2]

Dr. Dwelshauver's work upon the mechanics of attention is, unfortunately, too fragmentary to be of much use as material for theory. The author set out to investigate the question of the influence on the reaction-process of a signal, given at a definite interval before the sense-stimulus; but was unable to fulfil his intention. He found that the

[1] Martius, "Ueber die Reactionszeit und Perceptionsdauer der Klänge," *P. S.* vi. 394-416.

[2] Martius, "Ueber den Einfluss der Intensität der Reize auf die Reactionszeit der Klänge," *P. S.* vii. 469-486. Stumpf, *Zeitschr. f. Psych. u. Phys. d. Sinnesorgane*, ii. 230-232. Wundt, *Phys. Psych.* ii. 286.

advantage obtained by the use of the signal was, in general, greater for the sensory than for the muscular reaction-form. Some of the minor observations are interesting; as, *e.g.*, that the reagent's judgment of the length of his reaction is subject to the general psychological law of contrast.[1]—An as yet incomplete research by H. Leitzmann deals with the alterations in the length of the apperception-process dependent on the time-relation in which secondary stimuli (of the ear) and a primary stimulus (of the eye) stand to one another after their perception. It is interesting as being the work of a trained astronomer.[2]—In order to test the influence of practice on mental processes, Dr. Berger determined the time required for reading a certain number of Latin and German words by members of the different classes in a gymnasium, and by pupils of a preparatory school. He found the time to diminish with practice, at first very rapidly, then more slowly. Within his experimental limits, it never became entirely stationary. Control-experiments proved that this increased facility was in reality dependent for the main part upon practice, and but to a small extent upon general mental progress. The process of reading Dr. Berger analyses into a simple reaction, and an act of association. Upon the duration of a simple reaction we know practice to have no effect; and we are, therefore, led to explain the experimental results as referring, almost exclusively, to the central process of association. By "practice" it becomes gradually possible to apperceive simultaneously a large number of separate impressions in their logical connexion, phrases taking the place of words and the still earlier syllables.[3]

Finally, reference may be made here to Prof. Leumann's article on the relations of mental activity to breathing and circulation; in which a special application is given to Wundt's general caution as to the choice of reagents.[4]

[1] Dwelshauvers, "Untersuchungen zur Mechanik der activen Aufmerksamkeit," *P. S.* vi. 217-249. Dr. Dwelshauvers has published his results, together with a statement of Wundt's theory of apperception, in book form; under the title "Psychologie de l'Apperception et recherches expérimentales sur l'Attention" (Brussels, 1890).

[2] Leitzmann, "Ueber Störungserscheinungen bei astronomischer Registrirung" (i.), *P. S.* v. 56-95.

[3] Berger, "Ueber den Einfluss der Uebung auf geistige Vorgänge," *P. S.* v. 170-178.

[4] Leumann, "Die Seelenthätigkeit in ihrem Verhältniss zu Blutumlauf und Athmung," *P. S.* v. 618-631. In defence of the English anthropometrical method, according to which the reagent is directed to execute

(*c*) *Association.* Dr. Scripture's work on the associative train of ideas is a notable contribution to the experimental literature of association. The author's aim was the accumulation of factual material, on the ground of which the problems and laws of association could be formulated anew. He made no time-measurements; the investigation of the qualitative relations of the train of ideas to the object of sense being his special theme.

The observer sat in a dark chamber, and was subjected to light-, sound-, touch-, smell-, and taste-stimuli. In the first case, the light-impressions (picture, word, colour) appeared before him on the wall of the chamber, and lasted four seconds. At any moment within this time-limit he could describe his association. The advantages of the method are stated as follows: (1) The condition of consciousness before experimentation was approximately constant; the train of ideas being interrupted in every case by the "Now!" of the experimenter. (2) Disturbing perceptions were excluded by the darkness and quiet. (3) The series of reproduced ideas could be exactly controlled and reported by the observer. The results led Dr. Scripture to the formulation of four irreducible processes as comprised in the act of association: preparation, influence, expansion, after-effect. Preparation is the process whereby an idea becomes capable of exerting an influence upon the content of consciousness: its origin lies outside consciousness. The influence is not necessarily exercised; the prepared idea may disappear without effect. In Fechnerian language preparation is thus, more or less, a passing of the threshold. Influence takes place when an idea causes an alteration in conscious content, with or without interruption of the stream of thought. Expansion consists in the addition of ideas (or constituent parts of ideas) to an idea (or parts of it) already present. Sometimes ideas which have disappeared from consciousness exercise an influence on its later content.

The material illustrative of each process cannot here be dealt with. But especially to notice are two cases, in which the influence of unconscious ideas on reproduction is considered. The first of these is that of mediate reproduc-

the reaction-movement "as quickly as possible," it may be said that the reaction-time of 'real life' is probably obtained thereby in the great majority of cases. Lange pointed out that a natural preference of the muscular, sensorial, or mixed form goes along with difference of temperament (*P. S.* iv. 496). The times could be classified under these three heads, by comparison with the norms established by a more exact experimentation.

tion. An idea, it is maintained, is able to call up another idea, with which it is unconnected, if each has been at some time connected with a third idea, not now in consciousness. Thus, there is shown to the observer a Japanese word-symbol together with the word written in Latin characters; and, after some time, the same symbol with the corresponding German word. If, later, either of the written words alone is presented to him, the other is associated with it, without the conscious intermediation of the sign. Only in "favourable" cases were good results obtained by this method. Often there was no reproduction, or a wrong one, or the symbol recurred in consciousness. If all cases were counted, $\frac{r}{f} = 1{\cdot}155$; if those in which the symbol was possibly recurrent were excluded, $\frac{r}{f} = 2$. These numbers, besides proving the general position stated above, show that the general effect of the intermediate (unconscious or half-conscious) idea is much weaker than that of an apperceived idea. The second case to be noticed is that of after-effect. Can a not-perceived constituent of a complex idea have so great an after-effect that, if it alone is later perceived, it can call up the whole idea? A picture was shown to the observer, together with some simple object (colour, letter) in indirect vision. The exposure time was so short that he knew no more than that he had seen *something* indirectly. When the principal picture had been recognised, the secondary object was given alone, in direct perception; and the observer stated on what principal picture he had first thought. Thirty-four per cent. of the reactions were correct.

A theoretical discussion of the results the author reserves for a future article. Meantime, it is plain that the four basal processes above referred to are logical and not psychological. Logically, they can be separated; psychologically, they overlap one another. Moreover, the observer's inner experience was, to some extent, neglected to save the processes. Objection might also be taken to the experimental method. Dr. Scripture deals only with the reproduction occasioned by sense-perception. By lengthening the association-time, he might have also obtained results in pure ideational reproduction. The sense of sight was unduly preferred; that of smell, so important for association, unduly neglected. Again, the picture was exposed for the whole four seconds. It is possible that we have here the explanation of the fact that the associated feeling led back to the sense-

impression. In other respects, the four seconds' limit has no great claim to reality, for the observer could speak when he chose.

Neither can it be admitted that Dr. Scripture's experiments have succeeded in erecting mediate reproduction to a general law, possible or probable as the process may be, on other grounds. The only guarantee that, when the second pair of impressions $p$ $x$ is given, the idea of the former pair $d$ $x$ is not immediately associated with them, is the memory of the observer; and this cannot be always reliable. Theoretically, too, there seems no reason for the disappearance of $x$, unless it be that a Japanese symbol is difficult to reproduce. It was found that with complicated geometrical figures there was no reproduction; while, if the intermediary was a simple colour, it invariably recurred in consciousness.[1] As regards the experiments upon after-effect, a purely physiological explanation is possible. The object seen in indirect vision would excite a brain-process, even if it did not form part of conscious content at the time. The re-excitation of the same process by the later direct vision of the object would then bring with it a reproduction of the original direct perception. There need be no question of the influence of the idea, half-conscious or unconscious, of the object indirectly seen.

Dr. Scripture's great service to the psychology of association is that he has broken ground in the way of exact experimentation. No criticism of the positive results of his research can, of course, effect the value of this service. His criticism of the present association-psychology is interesting and acute; but final judgment cannot be passed before the appearance of the promised theoretical discussion.[2]

The object of Lehmann's two articles is less the explanation of the phenomenon of recognition, as such, than the determination of the number of the fundamental laws of association; and, in particular, of the claim of the law of Similarity to hold its place beside the law of Contiguity. Höffding, following Hamilton, J. S. Mill, and Bain, had

[1] It is a pity that Dr. Scripture has not given the numerical relations of his results in more detail. Could we compare directly the percentage of cases in which mediate reproduction occurred with the percentage in which the symbol undoubtedly recurred in consciousness, a judgment of probability would be possible.

[2] Scripture, "Ueber den association Verlauf der Vorstellungen," *P. S.* vii. 50-146. Mr. Galton is the founder of the experimental psychology of association: *Inquiries into Human Faculty*, pp. 185 ff. But valuable as his results are, his method was not sufficiently exact.

declared Similarity to be the primal law ; and the facts of recognition to be the best proof of this. Every reproduction by contiguity is preceded by a primitive similarity-association. He drew a distinction from the outset between immediate and mediate recognition. The former occurs when a sense-impression (*e.g.*, a spoken word) appears to us as known, without our being able to give any reason for our knowledge of it ; *i.e.*, when no other ideas arise in consciousness to explain the fact of its identification. Here it is impossible for an association by contiguity to have taken place. Rather does the spoken word call up the idea of its previous occurrence ; and to this attaches the quality of recognition. The idea fuses immediately with the present perception, and there are no other free ideas present in consciousness to bring about the association. We have a reproduction by similarity. Mediate reproduction occurs, on the other hand, when the idea of previous occurrence, called up by the spoken word, is a free idea beside the present perception. Thus is effected a primary association, on the foundation of which secondary contiguity-associations may arise.—Rather a difference of degree, one would think, than of kind.

Lehmann replies by a theoretical discussion of the laws of association. "Forms" and "laws," he points out, are not interchangeable terms. That the similarity-form occurs is undoubted ; but is similarity the cause of the reproduction? The decisive question is, whether there are facts which compel us to accept the law of similarity, or whether the law of contiguity is adequate to the explanation of the phenomena. If this latter is the case, the law of contiguity must be unhesitatingly adopted, for association by contiguity is certainly not explicable in terms of similarity ; and the logical law of parsimony directs the rejection of needless hypothesis. Höffding found the facts he required in the process of recognition, but his assumption of the original similarity-association, which precedes all contiguity-association, depends on a misapprehension. For no state of consciousness recurs ; but a state, completely or partially identical with a former state, may be induced by a present perception : and in this way there may arise contiguity-associations which effect the recognition.

Höffding rejoins, with justice, that Lehmann's experimental method was not exhaustive. The only recognition-process investigated was that for which consciousness had been already prepared by expectation, and the question of immediate recognition was not touched. To which Lehmann replies by a series of important experiments upon the recog-

nition of the smell of chemical compounds, &c. All stages of recognition,—from the "immediate" form up to express identification, with localisation in time and space,—proved to be explicable by the law of contiguity. Especially interesting are the intermediate cases, in which the manner of the associations only became clear to the observer after some thought, or upon suggestion from the experimenter. Lehmann concludes convincingly that there can be no recognition without reproduction by contiguity.[1]

At this stage of the discussion Wundt intervenes with a comprehensive article. He points out that of the two theories which alone remain in the field, the one of which refers all association to contiguity, while the other calls in the aid of similarity as well, the former has the methodological advantage. All explanation of the laws of association must proceed from the fact that the forms in which it is given are complex processes, intelligible only in the light of the elementary processes whose products they are. This thought is implicit in the controversy between Höffding and Lehmann; for both recognise the necessity of setting out from a consideration of recognition. But neither of them has carried it consequently and radically through.

The elementary processes to be considered are those of complication and assimilation; more especially the latter. Complication forms the basis of the successive association of disparate ideas; assimilation that of the successive association of ideas within the same sense-sphere. Wundt takes the latter only, and analyses out from it the ultimate associative processes.

Two elementary processes (*Verbindungsvorgänge*) are to be found in that of assimilation. (1) Those constituents of a perception, which previously have been often perceived, call up the constituents which are identical with them (*Verbindung des Gleichen*). (2) Through the intermediation of the latter, other constituents are called up, which are absent in the given impression, but which previously were in temporal and spatial connexion with the intermediaries.

What are, then, the so-called similarity- and contiguity-associations? The second elementary process is plainly the most essential factor in the latter form. On the other hand, association by similarity cannot be explained in terms of the

[1] Höffding, *Psychologie in Umrissen*, pp. 152-3. *Cf.* his four articles in the *Vierteljahrsschrift für wissenschaftliche Philosophie*, 1889; especially pp. 433 ff. Lehmann, "Ueber Wiedererkennen," *P. S.* v. 96-156; "Kritische und experimentelle Studien ueber das Wiedererkennen," *P. S.* vii. 169-212.

first elementary process; for similarity implies partial difference, as well as partial identity. And in the first process we were dealing only with the calling up of the identical constituents. As a matter of fact, both ground-processes enter more or less into the formation of all complex association-forms; and every complex association is explicable as product of the two processes. If the results of the first process are in the foreground of consciousness, the product is a similarity-association; if those of the second, an association by contiguity.

Wundt goes on to show that the different stages of recognition investigated by Lehmann and Höffding form a transition between simultaneous and successive association. They make clear the temporal disjunction of the constituents of the former. The importance of recognition for the explanation of association lies partly here, and partly in the fact that in it the *conditions* of the process of disjunction can be examined.

The article concludes with a discussion of Herbart's *frei steigende Vorstellungen*. The possibility of their occurrence is denied.[1]

(*d*) *Emotion.* The importance of Wundt's essay on the Emotions, which contains much more than is promised by the title, has been recognised on all hands. Many readers of the *Phys. Psych.* must have felt that while Sensation and Will came then to their full rights,—the one because of the prevalent direction of psychophysical investigation, the other through the apperception-theory and the discussions which it has called forth,—Feeling occupied a more or less subordinate place in the whole system. This is, of course, in part conditioned by the nature of the case: the feelings, and the psychical processes which are developed from them, are of all conscious content the most elusive and difficult of derivation. Wundt's present exposition falls under three heads: (1) a historical survey of German terminology; (2) Feeling and Emotion; (3) Emotion, Impulse, and Will. In the second section it is shown how empirical psychology avoids the errors of the extremists,—of intellectualism on the one hand, and physiology on the other. Simple mental processes can neither be defined nor derived. It is as wrong to look for the origin of feeling in primitive operations of thought as to regard the emotions as "disturbances of muscular innervation, arising by way of reflex". Feeling and Emotion are described and distinguished; feeling being the

[1] Wundt, "Bemerkungen zur Associationslehre," *P. S.* vii. 329-361. The question of an original similarity, in Höffding's and James's sense, apart from partial identity, is not discussed by Wundt.

simple, pleasurable or painful state (simple in respect of quality, not necessarily—as is the case with sensation—of origin also) experienced when consciousness is relatively undisturbed; emotion the more complex condition, which is characterised by an interruption (favourable or inhibitory) of the course of ideation. Emotion has, moreover, certain physiological concomitants, which themselves react upon it, rendering it in a still more complicated state. The disturbance of the train of ideas is the consequence of an act of apperception; the quality of the apperceived object, or the manner of its affection of consciousness, occasioning the strong excitation of feeling. This relation of Emotion to Apperception is the key to the fact of the expression of the emotions in external movements, and the consideration of these tends (through a short criticism of adverse psychological theory) to the third section.

The latter opens with a restatement of the author's theory of Will as simple, original mental process. The common derivation of will from feeling, through desire, is referred to an inadequate analysis of conscious content. In the actual operations of will, feeling and volition are inseparably connected; and it is owing to the greater intensity of the direction of will in such a complex process that the simple Impulse arises. There may, however, be present in consciousness many feelings and different directions of will. In such a case, either a labile equilibrium results; or, if one impulse is the strongest, yet not strong enough actively to overcome those opposed to it, Desire; or, finally, if this stage is passed, voluntary action or "choice". After a discussion of the psychology of choice, and a reminder to the reader that the simple processes disclosed by analysis are artificial products, the article concludes with a detailed criticism of Dr. Münsterberg's theory of volition.[1]

(*e*) *Disturbances of consciousness.* The question whether light or heavy sleepers dream more was made the subject of statistical inquiry, in Mr. Galton's way, by F. Heerwagen. Humanity was divided, for the purpose of the investigation, into men, women, and students.[2] The general results obtained were as follows:—

[1] Wundt, "Zur Lehre von den Gemüthsbewegungen," *P. S.* vi. 335-393. *Cf.* MIND, xvi. p. 302; *Zeitschr. für Psych.* ii. 316-321. Special attention may be called to pp. 387-8 of Wundt's essay. Here occurs the most definite statement of his position as regards *Innervationsempfindungen*; a statement which, but for facts to the contrary, one would have supposed unmistakable.

[2] Students were arranged in a separate class, as affording especially good material for observation, owing to uniformity of life, age, condition, &c.

(1) With increase of age, sleep becomes lighter and dreams fewer. Children, however, dream but little, if at all; the maximum of dream-frequency being reached between the ages of twenty and twenty-five. The curve of sleep does not, as might be expected, run parallel to the dream-curve, but in a straight line : sleep becoming steadily lighter from childhood onwards. (2) The intensity of dreams increases with their frequency. (3) Frequent dreaming and light sleep vary together, but not proportionally. A deep sleep is attended with but small decrease of dream-frequency. (4) The more frequent the dreams, and the lighter the sleep, the better is the waking memory of them. Women form a possible exception to this rule; though their sleep is light, not much of dreams is remembered.

There is a very great difference between the sexes. Women sleep more lightly and dream more than men. In men, the frequency of dreams has no influence on the duration of sleep; whereas this influence is very large in the case of women,—sleep with much dreaming lasting, on the average, an hour longer than dreamless sleep. Much dreaming brings with it, for women, the necessity of a longer period of sleeping (*e.g.*, of day-sleeping). Women who are light sleepers require half-an-hour less sleep than heavy sleepers. On the whole, women's sleep is more interrupted than men's. A suggested reason for this difference is that women can gratify their inclination in the matter of sleep more easily than men. The majority of men in question represented themselves as feeling tired on waking, the women not.

Factors in the general result are the time required for getting to sleep, the interruptions of sleep, the ability to sleep at will, mental disposition during the day, nervousness (which is greater in women than in students, and in students than in men), temperament, occupation.[1]

V. *Will.* It is impossible in the space now at command to give a satisfactory account or criticism of Dr. Külpe's chapters on the place of Will in modern psychology. Dr. Külpe, himself a follower of Wundt, passes in critical review the chief theories from the time of Herbart downwards; concluding with an especially clear and valuable exposition of Wundt's view. He emphasises the fact that the latter is strictly empirical. When we have analysed out the constituents of Sensation-complex and Feeling from conscious content, we are left with a something, which has for its

[1] F. Heerwagen, "Statistische Untersuchungen ueber Traüme und Schlaf," *P. S.* v. 301-320.

chief attributes spontaneity and unity. This 'something' is the primitive activity of will,—apperception: as much a part of conscious content as is "blue" or "pleasant". Again, Wundt makes apperception the content of the self-conscious Ego: but self-consciousness originates partly in a sum of ideas which possess the character of permanence, partly in the dependence of these upon our volition. Gradually the half-sensible, half-conceptual constituents fall away; and apperception alone takes their place.

I propose to take notice of one portion only of Dr. Külpe's work,—his discussion of the relation existing between apperception and feeling. In support of Wundt's theory of feeling, as set forth in the *Phys. Psych.* (that it arises as the reaction of apperception upon sense-impressions), Dr. Külpe gives four reasons. Firstly, in feeling of all kinds we are conscious of a greater spontaneity, or inner activity, than is the case in perception, and this spontaneity is one of the distinguishing characteristics of apperception. Qualities of sensation we ascribe to objects without us, and this although many sensations outlast the original external stimulation: but this is never done with tones of feeling. Secondly, both will and feeling are blunted by exercise, in the sense that the voluntary act becomes automatic (the idea that was once apperceived failing very soon to excite attention), the positive or negative feeling indifferent. Thirdly, perception always implies a corresponding stimulus; feeling is (at least in developed mental life) bound up with dispositions of consciousness, which have their history. The same holds of apperception. Fourthly, the most common forms of volition are so naturally and nearly connected with the feelings of pleasure and pain, that trouble is required to separate the two elements. Aversion and desire seem to the inner perception to be simple processes. On the other hand, the object (or idea) which excites these states of mind is comparatively unimportant.

The feelings of sense,—pleasure and pain,—are the most frequent motives to voluntary action. It is plain that apperception stands also in close connexion with the elementary æsthetic feelings, which depend on the temporal and spatial relations of ideas; and also with the intellectual feelings, which accompany the apperceptive association of ideas, and so appear as its immediate effects. So is it with emotion. In the simplest case, an emotion is called forth by the action of an unexpected stimulus upon consciousness. The stimulus is unexpected when the apperception has not been adapted to it, so that it makes its way by force to the mental fixation-point. An emotion may also be called into being, if the stimulus has been apperceived, but is so strong as

quickly to exhaust the apperception. Finally, impulses are distinguished from emotions by the fact that in them external movements enter into the service of the emotional excitations.

This short review may give some idea of the immense importance in Wundt's psychology of his theory of volition, and of his view of the constant interaction of two out of the three ultimates of mental analysis. In the sphere of sensation we are on better-known and surer ground, so that the function of apperception there need not be discussed.[1]

The brief review of psychological researches published in the *Philosophische Studien*, which it was the aim of the present paper to give, is now concluded. It must be remembered that the *Studien* has a threefold function to perform: firstly, as the organ of Wundt himself; secondly, as the place of publication of the best philosophical work done under his direction; and, thirdly, as a journal of experimental psychology,—principally, of course, for the Leipsic laboratory. Several articles, some of considerable importance, have, therefore, been passed over in the above survey.[2] When the number and quality of the remainder are taken into account, together with the fact that the *Studien* forms only one out of many serial publications devoted mainly or exclusively to experimental psychology, it seems a not unreasonable hope that there will exist, in the near future, a body of knowledge sufficient to justify the claim of the science to independence. The names of psychologists will gradually be subordinated to that of the field in which they have worked: and the establishment of a Professor of Psychology as a natural science, beside the Professors of Physics and Physiology, will then be a matter of course.

[1] Külpe, "Die Lehre vom Willen in der neueren Psychologie," *P. S.* v. 177-244, 381-446. The reader of the above paragraph will have been reminded of Wundt's relationship to Lotze.—In comparing this article with that of Wundt on the Emotions, it must be remembered that, in his psychology, the words "will" and "apperception" have a twofold meaning,—(1) as indicating a primitive mental activity, and (2) as expressing the complex states derived from this in different directions.

[2] I subjoin the names of these for the sake of completeness. (1) *Systematic Philosophy.*—Wundt, "Ueber die Eintheilung der Wissenschaften," *P. S.* v. 1-57. "Biologische Probleme," v. 327-380. "Was soll uns Kant nicht sein?" vii. 1-49. (2) *Logic.*—Brix, "Der mathematische Zahl-begriff und seine Entwicklungsformen," v. 632-677, vi. 104-166, 261-334. (3) *Theory of Knowledge.*—Reichardt, "Kant's Lehre von den synthetischen Urtheilen a priori in ihrer Bedeutung für die Mathematik," *P. S.* iv. 595-639. Külpe, "Das Ich und die Aussenwelt," i., vii. 394-413. (4) *Ethic.*—Schubert, "Adam Smith's Moral-philosophie," vi. 552-604. (5) *Miscellaneous.*—"Drei Briefe von Johann Friedrich Herbart," v. 321-326. Wundt, "Zur Erinnerung an Gustav Theodor Fechner," iv. 471-478, 640.

# IV.—THE LOGICAL CALCULUS. II.

By W. E. Johnson.

*General Aim of the Paper.* In offering an exposition of the Logical Calculus, my aim is not to add one more to the numerous systems of notation and symbolic method that have already been worked out more or less independently, but rather to bring out some underlying principles and assumptions which belong equally to the ordinary Formal Logic, to Symbolic Logic, and to the so-called Logic of Relatives. I hope at the same time to be able to present the work of different writers on different branches in a more systematic and comprehensive form than has hitherto been done. My results and methods coincide in their general bearing with those of the writers who have done most for Symbolic Logic. But in a general review of the opinions of others, I am obliged to urge, somewhat at length, what seem to be errors. Dr. Venn has probably done more than any other writer to present the Boolian Calculus in a philosophic form; while Mr. Peirce and Dr. Mitchell have made the most important extensions or simplifications. And I shall follow very closely some of the methods of the two latter writers.

In working out formulæ I have tried to keep clearly in view the distinction and relations between the intelligent and the non-intelligent processes involved. Only in this way can we properly appreciate both the power and the limitations of the Calculus. As a matter rather perhaps of detail than of principle I wish to urge the importance of treating the synthesis of unanalysed propositions before that of analysed propositions. There are several grounds for this order of treatment. Unanalysed propositions may be synthesised on principles independent of the analysis of the proposition, as is exemplified in the treatment of the pure hypothetical, alternative, or disjunctive arguments which, in ordinary logic, culminate in the various forms of the Dilemma; while, conversely, the analysis of quantitative propositions (and *a fortiori* the synthesis which follows from this analysis) is dependent on the general principles of propositional synthesis. Again, by the procedure that I propose, we pass by a natural transition from ordinarily quantified propositions to the Logic of Relatives, and thus reach more

and more complex forms in the order of their complexity. But a stronger ground for my method is that we are led on, not only to more and more *complex* forms, but also to more and more essentially disputable and difficult questions in carrying out this order of treatment. In brief, my justification for the plan adopted is that it is throughout *analytic*.

*The Principle of Formal Inference.* The principle of formal inference is expressed in the formula "(*b* and *c*) implies *c*": *i.e.*, a conclusion, formally reached, is simply a determinant of the data expressed in the premisses. In the sense in which factorisation is said to be the inverse of multiplication, formal implication is the inverse of determinative synthesis. This principle reduces the *Dictum de omni et nullo* to its barest and most tautological form. When we infer from *all*, *i.e.*, $A_1$ and $A_2$ and . . . to a particular $A_1$ contained in the *all*, we recognise the *all* as a condensed determinative synthesis within which the determinant $A_1$ is contained. But a distinction may be made between immediate and mediate inference. In so-called mediate inference, two or more premisses are given to be determinatively synthesised, although the conjunction *and* is generally unexpressed. This determinative synthesis may be put into a new form, in which we detect a new determinant not contained in either of the original premisses taken separately. Mediate inference thus includes two parts: *first* a synthetic and *secondly* an analytic operation. The process is, therefore, identical with that by which we combine 6 and 4 as factors, and in their product detect a new factor 8 which was not contained in either of the original factors. Of course there is a *selective* act involved in the choice of the determinant which we take as our conclusion. We do not realise the omitted determinants in the same act of apprehension by which we select the determinant needed. But none the less must we recognise the conclusion to *be* a determinant of the data. It is this characteristic which marks off formal from non-formal inference. In the latter the conclusion does not appear as a mere determinant of the premisses:—the grounds of our inference are not explicitly formulated. This broad distinction will be indicated by representing *non-formal* implication by a merely *operational* symbol, and formal implication by a *partial* equivalence, as will be explained in the next section.

*Notation for Propositional Synthesis.* As determinative synthesis has always been represented by multiplication, we shall use the symbol $a \,.\, b$ to stand for '$a$ and $b$'. The reciprocal relation between *and* and *or* forcibly suggests the use

of the symbol $a \cdot b$ to stand for '$a$ or $b$'. For the purposes of the present article such a notation will be found useful, and I shall venture to adopt it in the simple formulæ that will be introduced, although I feel strongly the objections that may be urged against any arbitrarily imposed notation. The separate constituents $a, b$, are called the *determinants* of the determinative synthesis $a \,.\, b$, and the *alternants* of the alternative synthesis $a \cdot b$. I shall not introduce any other symbols, except such as are naturally suggested or derived from these. Thus from the symbol of equivalence $=$, we may derive two others expressing *partial equivalence*. If a *determinant* is dropped from one side of an equivalence we may use the symbol $= \ldots$ defined by the convention $b \,.\, c = \ldots c$. If an *alternant* is dropped, we may use the symbol $= \cdot\cdot\cdot$ defined by the convention $b \cdot c = \cdot\cdot\cdot c$. These symbols merely indicate the omission of a determinant or alternant. The calculator will, therefore, understand by the symbol $a = \ldots c$ that "$a$ contains $c$ as a determinant," and by the symbol $a = \cdot\cdot\cdot c$ that "$a$ contains $c$ as an alternant": *i.e.*, $a = \ldots c$ means $a = b \,.\, c$ and $a = \cdot\cdot\cdot c$ means $a = b \cdot c$ where the $b$ has been dropped.

It will be observed that, if the equivalence $a = b \,.\, c$ is given on the authority of Formal Logic, the partial equivalence $a = \ldots c$ may be *interpreted* as meaning "$a$ formally implies $c$". And the reciprocal relation between *and* and *or* will show that, if $a = b \cdot c$ is given on the same authority, $a = \cdot\cdot\cdot c$ may be interpreted "$a$ is formally implied by $c$". And, as I shall only use *formal* equivalences, these interpretations may be always made. But in the mechanical operations of the calculator this interpretation will not be involved. For him, the symbols will mean merely the omission of determinants or alternants dropped for convenience.

In the present paper, I shall not work out any of the rules that may be derived from the fundamental laws of propositional synthesis, as these are familiar to any reader of symbolic logic.

*Notation for the Molecular Analysed Proposition.* The molecular proposition—which cannot be expressed as a synthesis of more elementary propositions—involves a single (absolute or relative) predication and a number of interconnected individual subjects. I will adopt a simple notation suggested by Mr. Peirce's paper on "The Logic of Relatives" in the Johns Hopkins' *Studies in Logic*. To indicate the different treatment accorded to the subject and predication, the former will be written as a suffix to the

latter.[1] We then express molecular propositions of any order as follows: $p_x$, $p_{xy}$, $p_{xyz}$, $p_{xyzu}$, &c. These may be taken to represent such propositions as "Coal is produced," "Coal is produced in England," "Coal was produced in England during 1890," "Coal was produced in England during 1890 for fuel". Here $x$ means coal; $y$ England; $z$ 1890; $u$ fuel. Again $p$ means 'is-produced' in every case, but involves also in the several cases the prepositions *in, during, for*—the interconnexions of which among the different subjects are indicated by their order.[2]

In this notation, we must point out (1) the relative nature of the propositional analysis. The analysis need only be carried out in so far as it affects the succeeding propositional synthesis. Thus any of the four given propositions might be represented by the single symbol $p$, if the synthesis of $p$ with other propositions did not depend on its analysis. Or, any of them might be represented by $p_x$, if we only required to recognise the subject $x$ as distinct from other subjects. In this way, of course, $p$ would have fuller import as we pass from one proposition to the next. And this shows that we may drop any subject from the symbol denoting a *proposition*, and what remains will denote the full *predication* for that particular subject. This has some importance in the sequel. We must point out (2) the relative nature of the *molecularity* ascribed to these propositions. For symbolic purposes, all that is meant by calling $p_x$ molecular is that $p_x$ and $\bar{p}_x$ are to be taken as contradictories. Of course, if the subject $x$ contained a quantitative element, $p_x$ and $\bar{p}_x$ would not be contradictories. Hence any latent quantification must be incorporated in the predication. Taking *Coal* as a singular name, standing for a single *sort* of substance, the proposition "Coal is produced" may be taken as contradicting (say) "Coal is a gift of nature". But the contradictory of "All (or some) sorts of coal are produced"

[1] Since we may give a substantive form to the predication itself by constructing an *abstract* name, there would seem to be no need that our symbols should distinguish between predication and subject. Thus *any* proposition might be expressed by a common relative predication "belongs to" which could be always omitted: *e.g.*, mortality *belongs to* Socrates. This expedient would, however, be inconvenient when we had to combine determinatively and alternatively different predications —some affirmatively and some negatively—for the same subject. Even here, a relative predication is required for the expression of the contradictory "does not belong to".

[2] The *order* of the subjects (*i.e.*, their propositional interconnexion) need only be considered when we are dealing with subjects belonging to the same category or universe.

is not "All (or some) sorts of coal are gifts of nature". I mention this elementary point in order to show that an apparently molecular proposition may often have to be resolved.[1]

*Notation for the Synthesis of Molecular Propositions.* The synthesis of moleculars having the same subject is represented by a synthesis of the predications. Using the proposed symbols for *and* and *or*, we write

$$p_x \cdot q_x = (p \cdot q)_x : \; p_x \dot{\cdot} q_x = (p \dot{\cdot} q)_x.$$

The suffixes are, for the symbolist, mere differentiating marks of propositions, and he need know nothing of the nature of the union expressed by $p_x$ or $(p \cdot q)_x$. In the reverse problem of synthesising moleculars, having the same predication but different subjects, a similar notation might be employed. But this would lead to ambiguity, if we were to compound *both* subjects and predications, or if we were to negate the predication of a compound subject. The form "$x$ and $y$ are $p$ or $q$" is ambiguous. It might mean one or other of two different statements:—

(1) ($x$ is $p$ and $y$ is $p$) or ($x$ is $q$ and $y$ is $q$).
(2) ($x$ is $p$ or $x$ is $q$) and ($y$ is $p$ or $y$ is $q$).

The difference is a difference in bracketing; or, as we may say, in the *relative externality* of the syntheses involved. Common speech adopts the convention: "Subjects are externally synthesised and predications are internally synthesised," and would, therefore, give the second interpretation. This at least is clearly the case, when the synthesis in the subject is expressed quantitatively. Thus the propositions:

(1) Every man is knavish or foolish.
(2) Some men are knavish and foolish,

would mean, if $M_1$, $M_2$ &c., are the men contemplated,

(1) ($M_1$ is $k$ or $f$) and ($M_2$ is $k$ or $f$) and &c.
(2) ($M_1$ is $k$ and $f$) or ($M_2$ is $k$ and $f$) or &c.

Thus the subject-synthesis is external to the predication-synthesis in ordinary speech.[2] Now our symbols must be chosen so as to indicate in every case the relative externality of the syntheses involved. This is the main consideration

[1] Compare, for example, such occasions for fallacy as are supplied by "Epimenides is a liar" or "That surface is red," which may be resolved into "All or some of the statements of Epimenides are false," "All or some of the surface is red".

[2] This convention of language partly accounts for Hamilton's confusions in quantifying the predicate.

in multiple quantification. Adopting the "stop" notation, we are inevitably led on to represent "Every $m$" by the symbol $\underset{\cdot}{m}$; and "Some $m$" by the symbol $\dot{m}$. We shall indicate that the range of determination and alternation is the same in the universal and particular, by giving the simultaneous definitions

(1) $m_1 \,.\, m_2 \,.\, m_3 \ldots m_\infty = \underset{\cdot}{m}$; (2) $m_1 \cdot m_2 \cdot m_3 \cdot \cdots m_\infty = \dot{m}$.

The propositions "Every $m$ is $p$ or $q$," "Some $m$ is $p$ and $q$" are written $\underset{\cdot}{m}(p \cdot q)_m$ and $\dot{m}(p \,.\, q)_m$. These are to be read, "For every $m$, it is true that *that* $m$ is $p$ or $q$": "For some $m$, it is true that *that* $m$ is $p$ and $q$": and thus the externality of the substantive synthesis is indicated in our notation.[1] In the simplest cases the suffix may be omitted without danger of ambiguity, but the necessity for this complete notation will be seen when we come to complex multiple quantifications.

The well-known rule for expressing the contradictory of a compound proposition is: Replace each constituent proposition by its contradictory and each *and* by *or* and conversely. Hence

$\underset{\cdot}{m}p_m$ is contradicted by $\dot{m}\bar{p}_m$:
and $\dot{m}p_m$ is contradicted by $\underset{\cdot}{m}\bar{p}_m$.

Finally, any proposition having a predicatively defined subject, may be reduced to a form in which the subject appears as a common universe of subjects. Thus, "Every subject, that is $p$, is $q$" and "Some subject, that is $p$, is $q$" become

$$\underset{\cdot}{m}(\bar{p} \cdot q)_m \text{ and } \dot{m}(p \,.\, q)_m \text{ respectively,}$$

in which the internality of the predication-synthesis and the externality of the subject-synthesis are made manifest.

*The Synthesis of Singly-quantitative Propositions.* We have to combine universals and particulars alternatively as well as determinatively. This seems to have been first definitely recognised by Dr. Mitchell [*Studies in Logic*, p. 78]. This writer's work seems to me to contain the most important simplification of the Boolian Logic that has appeared. The results of this section have been suggested to me by his work. By the introduction of *alternative* syntheses and by the adoption of the *affirmative* form of the universe-propositions (instead of Boole's negative form), he is enabled both to simplify and to extend the range of logical

[1] This mode of symbolism is only an abbreviated form of the Mathematical symbols $\Sigma$ and $\Pi$; and is equivalent to that used by Mr. Peirce on p. 200 of the *Studies in Logic*.

symbolism in a most suggestive way. The following six formulæ are nearly the same as those given [on p. 78] by Dr. Mitchell. As we are dealing with the same range of subjects, we may omit the *suffix*.

1. The Determinative synthesis of Universals.

$$\textit{Formula:}\ (\dot{m}p)\,.\,(\dot{m}q) = \dot{m}\,(p\,.\,q).$$

2. The Alternative synthesis of Particulars.

$$\textit{Formula:}\ (\dot{m}p)\cdot(\dot{m}q) = \dot{m}\,(p\cdot q).$$

3. The Determinative synthesis of Particulars.

$$\textit{Formula:}\ (\dot{m}p)\,.\,(\dot{m}q) = \cdots\dot{m}\,(p\,.\,q).$$

4. The Alternative synthesis of Universals.

$$\textit{Formula:}\ (\dot{m}p)\cdot(\dot{m}q) = \ldots.\dot{m}\,(p\cdot q).$$

5. The Determinative synthesis of Universal and Particular.

$$\textit{Formula:}\ (\dot{m}p)\,.\,(\dot{m}q) = \dot{m}\,(p\,.\,q)\,.\,\dot{m}q.$$

6. The Alternative synthesis of Particular and Universal.

$$\textit{Formula:}\ (\dot{m}p)\cdot(\dot{m}q) = \dot{m}\,(p\cdot q)\cdot(\dot{m}q).$$

Formula (1) (from which the others are derived) gives the important, though obvious, rule: "Universals may be determinatively combined without loss of force into a single universal". This was one of the principal results attained by Boole; though he obscured its simplicity by the negative form into which he transformed his propositions. The formula is *proved* in precisely the same way as the distributive law in the Algebra of Integral Numbers: *e.g.*, $(a + b) \times 3 = (a \times 3) + (b \times 3)$. In fact, just as multiplication is a condensed addition, so is universal quantification a condensed determinative synthesis. The analogy is more than superficial. Provided, then, we are dealing with *determinative* propositional synthesis only and with *universal* quantification only, the quantification $\dot{m}$ may be omitted: and the *predications* may be combined just as unanalysed propositions are combined. This obvious result partially accounts—in my view—for Mr. Peirce's treatment of the universal and the hypothetical as identical logical forms. At least, I should hold that only in this limited case is the identification formally valid; and that the limitation prevents our accepting any such identification as fundamental.

The first four formulæ give the rule: "A determinant or alternant of any proposition may be found by taking a determinant or alternant of the predication". This simple result

arises from adopting Dr. Mitchell's plan of expressing propositions in the affirmative form. Formula (5) shows how a more determinate particular conclusion arises from the (determinative) combination of a universal and particular premiss. The three formulæ (1), (3), (5) for determinative synthesis thus cover the ground of the ordinary syllogistic combination of two premisses.

Formulæ (2), (4), and (6) relate to Alternative Syntheses. Now an alternative may be expressed as a hypothetical; and, since it is in reference to hypotheticals that discussion has arisen, I will examine these in their hypothetical form.

2. Some S is $p$ if every S is $q$ = Some S is $p$ or Some S is $\bar{q}$. This *is equivalent* by (2) to

Some S is ($p$ or $\bar{q}$) = Some S is ($p$ if $q$).

4. Every S is $p$ if some S is $q$ = Every S is $p$ or Every S is $\bar{q}$. This, by (4), *formally implies*

Every S is ($p$ or $\bar{q}$) = Every S is ($p$ if $q$).

6. Every S is $p$ if every S is $q$ = Every S is $p$ or Some S is $\bar{q}$. This, by (6), *is formally implied by*

Every S is ($p$ or $\bar{q}$) = Every S is ($p$ if $q$).

By contraposition the above hypothetical = Some S is $\bar{q}$ if some S is $\bar{p}$ = Some S is $\bar{q}$ or Every S is $p$, which of course gives the same result.

*Summing up for hypotheticals:—*

2. A universal antecedent and particular consequent *is equivalent to* a particular categorical.

4. A particular antecedent and universal consequent *implies* a universal categorical.

6. A universal antecedent and consequent or a particular antecedent and consequent *is implied by* a universal categorical.

Now Dr. Venn—without distinguishing these three cases of the hypothetical—regards form (6), *viz.*, "(Every S is $p$) if (every S is $q$)," as equivalent to the universal categorical "Every S is ($p$ if $q$)"; *i.e.*, "Any S that may be $q$ is $p$" [see forms is a distinction of *bracketing*. Thus:—

*Symbolic Logic*, p. 274]. The distinction between the two

(Every S is $p$) if (every S is $q$) = ($S_1$ is $p$ and $S_2$ is $p$), &c., if ($S_1$ is $q$ and $S_2$ is $q$, &c.).

Every S is ($p$ if $q$) = ($S_1$ is $p$ if $S_1$ is $q$) and ($S_2$ is $p$ if $S_2$ is $q$), &c.

As formula (6) shows, the former *is implied by* the latter, but not *vice versâ*. For the former is consistent with the assertion "Some S is $\bar{p}$ $q$," which contradicts the latter.

The essential differences between the three hypothetical forms and between either of these and the universal categorical may be illustrated by common examples. But it is necessary to point out that the logical force of the word *some* when used in the *antecedent* of a hypothetical is expressed by the word *any*. To indicate the correctness of the rules for the different forms into which a hypothetical may be thrown, and to bring out its exact force, I shall give to each its two contrapositive forms. Let us consider, then, the several positions that might be maintained by a supporter of compulsory vaccination.

The most timid defender would use form (2) thus:—

If all are unvaccinated, some will have small-pox = If none are to have small-pox, some must be vaccinated. This, by formula (2), is equivalent to the particular categorical: There are some who must be vaccinated or they will have small-pox.

On the other hand, the boldest would use form (4) thus:—

If any are unvaccinated, all will have small-pox = If any are to be free from small-pox, all must be vaccinated. This, by formula (4), *implies:* All who are unvaccinated will have small-pox. But it is clear that the hypothetical here means *much more than* the universal categorical.

But the most probable position for the defender of compulsory vaccination to take is expressed in form (6) thus:—

If any are unvaccinated, some will have small-pox = If none are to have small-pox, all must be vaccinated. This, by formula (6), *is implied by:* All who are unvaccinated will have small-pox. But it is clear here that the hypothetical *does not mean as much as* the universal categorical.

These illustrations fulfil the requirements of Dr. Venn's universal categorical form. For no assumption is made that there *are* any persons unvaccinated either in the categorical or in the hypothetical forms. When Dr. Venn says that he interprets the categorical as a *hypothetical*, he only means that he does not *assume* the existence of the subject-term. But this does not render the assertion hypothetical. The assertion of non-existence which remains is made *categorically*—not on the supposition of any other proposition. It is true that we may write the categorical: "(Even) if there *are* any unvaccinated persons, (yet) there will be no unvaccinated persons free from small-pox". But the antecedent here is superfluous, because its contradictory would formally imply the consequent. Hence the same meaning is expressed by the categorical assertion of the consequent by itself.

The above examination shows the necessity of distinguish-

ing the *conditional* form: "If any S is $q$, *that* S is $p$" = Every S is ($p$ if $q$)," in which the conjunctive synthesis is external to the hypothetical synthesis, from the *hypothetical* form: "If every S is $q$ every S is $p$," in which two universals of independent import are hypothetically synthesised so that the conjunctive synthesis is internal to the hypothetical synthesis. This—the simplest case—directly leads on to multiple quantifications. Thus take Dr. Venn's example (p. 329): "If the English harvests are bad, the American corn-dealers will gain". It is obvious that this is not a *hypothetical* at all. It does not combine two propositions of independent import: but it identifies all the *years* in which one phenomenon occurs with some of the *years* in which another phenomenon occurs. It means: "Every year in which the English harvests are bad is a year in which American corn-dealers gain"; or contrapositively: "Every year in which American corn-dealers do not gain is a year in which the English harvests are not bad". Of these two contrapositive forms for expressing the proposition as a categorical universal, the former is the more direct and natural, the latter is alone used by Dr. Venn. His symbols will not allow the former, because they assume that the terms "English harvests," "bad," "American corn-dealers," and "gainers" are *fundamenta divisionis* of one and the same universe of years or cases. But the terms "bad" and "gainer" are predications qualifying the substantives "harvest" and "corn-dealers" which belong to an altogether different category from that of years. We are here, in fact, in face of a multiple quantification, in which different categories of things are combined by relative predications. This further analysis that we may make is only necessary in so far as we require subsequently to combine the given proposition with others, in which harvests in general or businessmen in general are brought into relation with years in general. The analysis above given—in which merely *years* are divided according as the English harvests are bad or not and according as the American corn-dealers are gainers or not—would be sufficient for simpler purposes. This again illustrates the principle that our propositional analysis is relative to the needs of subsequent synthesis.

*Transition from the Synthesis of Unanalysed Propositions to Multiple Quantification.* An unanalysed proposition is of a single type, say $l$. Two propositions $l$ and $l'$ may be combined determinatively or alternatively. Thus we have the *two* forms:—

$$(1)\ l.l'\,;\quad (2)\ l\cdot l'.$$

Now suppose that the propositions $l$, $l'$ are differentiated by referring to different subjects. Thus let $l$ mean "$x_1$ is lovable" and $l'$ mean "$x_2$ is lovable". Taking an aggregate of subjects—combined determinatively or alternatively—in the forms $x_1 . x_2 . \ldots . x_\infty = \dot{x}$ and $x_1 + x_2 + \ldots + x_\infty = \dot{x}$, we arrive at the *two* singly-quantified types :—

$$(1)\ \dot{x}l_x\ ;\ (2)\ \dot{x}l_x.$$

These mean respectively, "All $x$'s are lovable," "Some $x$'s are lovable". Again combining, determinatively and alternatively, two such propositions of similar type, we have the *four* forms :—

$$(1)\ yl_y . yl'_y\ ;\ (2)\ yl_y + yl'_y\ ;\ (3)\ \dot{y}l_y . \dot{y}l'_y\ ;\ (4)\ \dot{y}l_y + \dot{y}l'_y .$$

Now suppose that the predications $l$, $l'$ are differentiated by referring to different *second* subjects; so that $l$ means "is loved by $x_1$" and $l'$ means "is loved by $x_2$". Then, combining an aggregate of such predications in the above four ways, we have the *four* doubly-quantified types :—

$$(1)\ \dot{x}\dot{y}l_{xy}\ ;\ (2)\ \dot{x}yl_{xy}\ ;\ (3)\ x\dot{y}l_{xy}\ ;\ (4)\ \dot{x}\dot{y}l_{xy}.$$

These mean, respectively :—

(1) All $x$'s love all $y$'s.
(2) Some $x$'s love all $y$'s.
(3) All $x$'s love some $y$'s.
(4) Some $x$'s love some $y$'s.

Here it is essential to observe that (2) and (3) are of different types. In (2) the alternative synthesis is external to the determinative synthesis. In (3) it is internal. In other words, (2) means "Some *the same* $x$'s love every $y$": but (3) means "All $x$'s love some *it may be different* $y$'s". Hence these forms cannot be converted without ambiguity. For (2) does not mean "All $y$'s are-loved-by some $x$'s," nor does (3) mean "Some $y$'s are-loved-by all $x$'s". I attempted in my last paper to use the terms "certain" and "some or other" to indicate the distinction required, so as to give an *apparent* possibility of conversion. But this method is perhaps misleading. The forms "All $x$'s love certain $y$'s" and "Some or other $x$ loves all $y$'s" are likely to be misunderstood. For the apparent predication "loves certain $y$'s" is not a real predication, for it would have different meanings in different contexts. And the apparent quantification of the subject "Some or other $x$" is not a real quantification, for the predication to which it is attached would not necessarily belong to any one subject in the collection $x$. Out of the four *types* we thus get *six* varieties (in which an $x$

is lover and a $y$ is loved); *i.e.*, we may add to the four given types:—

$$(5)\ \dot{y}\dot{x}l_{xy} \text{ and } (6)\ y\dot{x}\dot{l}_{xy};$$

where the varieties (5) and (6) are of the same *types* as (2) and (3) respectively. These should be read "Some $y$'s are-loved-by every $x$," and "Every $y$ is-loved-by some $x$". All the six varieties may be written with a converse predication symbol $\check{l}$, which would mean *is-loved-by*, and is defined by the equivalence $l_{xy} = \check{l}_{yx}$. But in this transformation the *suffixes* only must be interchanged, *not the order of the quantified terms* (unless these are both universal or both particular). Whether, then, we read the propositions in the form *loves* or in the form *is-loved-by*, we must regard the *externally* quantified term as the true logical subject and what is left when that term is dropped as the predication for that subject. Of course the contradictories of the six varieties may be written down by the rule of interchanging *and* and *or* without violation of the externality and internality of the syntheses. The contradictories, taken in the above order, are:—

$$\dot{x}\dot{y}\bar{l}_{xy};\ \dot{x}y\bar{l}_{xy};\ \dot{x}\dot{y}\bar{l}_{xy};\ \dot{x}y\bar{l}_{xy};\ y\dot{x}\bar{l}_{xy};\ \dot{y}\dot{x}\bar{l}_{xy};$$

showing that pairs of contradictories belong to the types (1) and (4) or (2) and (3).

The four types may be called UU, PU, UP, PP, where U and P stand for universal and particular respectively. The most important question to examine here is the rules for inference *by commuting the order of the quantified terms.* The rules are:—

A. Two similarly quantified terms may be commuted without change of force; *i.e.*,

$$\dot{x}y\dot{l}_{xy} = y\dot{x}\dot{l}_{xy} \text{ and } \dot{x}\dot{y}l_{xy} = \dot{y}\dot{x}l_{xy}.$$

This rule is a direct corollary from the associative and commutative laws.

B. Of two dissimilarly quantified terms, the internal has potency over the external; *i.e.*,

$$\dot{x}\dot{y}l_{xy} = \ldots . y\dot{x}\dot{l}_{xy} \text{ and } \dot{x}\dot{y}l_{xy} = \cdots \dot{y}\dot{x}l_{xy}.$$

In other words, the proposition is more or less determinate according as the more or the less determinate synthesis is *internal* to the other. Thus, "Some $x$'s love all $y$'s" implies "All $y$'s are loved by some $x$'s," but not conversely. This again is a corollary from the Distributive Rules.

Confining ourselves still to a single predicative term, by the same process according to which we found 4 types for the doubly-quantified proposition, we shall find 8 types for

the triply-quantified, and generally $2^n$ types for the $n$-ply-quantified proposition. The rules (A) and (B) for commuting the order of two *adjacent* quantified terms will still hold. For the *external* syntheses are always to be regarded as *subject*, and what remains as *predication* to that subject. Hence, using the rule: "A determinant of an (affirmatively expressed) proposition may be found by taking a determinant of its *predication*," the general applicability of the rules (A) and (B) is seen to follow.[1]

*Complex Combinations Involving Multiple Quantifications.* In the last section propositions containing only one predicative term were introduced. The types that arise when more than one predicative term is introduced are numerous. *All the varieties of type depend on the relative internality and externality of the determinative and alternative syntheses involved.* Perhaps the best way of indicating the gradual growth in complexity is to choose, as far as possible, examples from ordinary speech and science, so as to show how frequent is the use of these complex forms of multiple quantification. The particular form that we choose for symbolising the propositions will depend, to some extent, on the needs of subsequent synthesis. We may take as ultimate subject-term, to which quantification is attached, any term whose applicability to at least one object is assured. Such terms may be regarded as *purely denotative; i.e.*, as reached by a *collective*, not a *selective*, process. On the other hand, a quantified term which is regarded as defined predicatively, must be represented by the substantive category from which its application is selected, as well as a predicative term which determines how the selection is made.

1. Dr. Mitchell gives two simple examples: "During some (the same) part of the year all the Browns were ill," and "All the Browns were ill during some part (or other) of the year". Regarding the name *Brown* as purely denotative, these propositions would be symbolised $\dot{y}b(i_{\dot{b}y})$ and $\dot{b}\dot{y}(i_{\dot{b}y})$ respectively, in which only one predicative term occurs. But using the predication $b$ to denote *is-named-Brown*, and the substantive category $p$ to denote any *person*, we must distinguish between the absolute predication $b$, which does not relate to time, and the relative predication $i$,

[1] The six varieties of doubly-quantified propositions are given by Dr. Mitchell on p. 87 of the *Studies in Logic*. The general formulæ for commuting the quantified terms are given by Mr. Peirce on p. 202. But these two writers have not brought their methods here into connexion. And Dr. Mitchell appears to confine the application of his own method to double quantification, in which *time* is the secondary differentiating mark.

which means "*is ill during*".[1] The two propositions may then be symbolised:—

$$\dot{y}\dot{p}(\bar{b}_p \cdot i_{py}) \text{ and } \dot{p}\dot{y}(\bar{b}_p \cdot i_{py}).$$

The same two symbolic expressions might be interpreted: "There are some young writers ($y$) who imitate every bad ($b$) poet ($p$)," and "Every bad poet is-imitated-by ($i$) some young writer or other". The forms of synthesis are the same here as in Dr. Mitchell's examples though the substantive categories are different.

2. Dr. Venn's example may be interpreted: "Any year in which all the English harvests are bad is a year in which all the American corn-dealers gain". This might be symbolised:—

$$\dot{y}\{\dot{h}(e_h.\bar{b}_{hy}) \cdot \dot{c}(\bar{a}_c \cdot g_{cy})\}.$$

In this example $y$ means *any year;* in the last example $y$ meant *any moment in the given year*. Of course the degree to which we carry the analysis is arbitrary, and the proposition might be simply written:—

$$\dot{y}(\dot{e}\bar{b}_{ey} \cdot \dot{a}g_{a^y}),$$

where $e$ stands for English harvests and $a$ for American corn-dealers. The important point to observe is that the predications $b$ and $g$ are relative to the year in question.

3. Take the definition of a *circle*. Here we have to express: "There is some point $c$ and some distance $r$ such that every point $p$ is either on the locus $l$ and at distance $r$ from $c$, or is not on the locus $l$ and is not at distance $r$ from $c$". This may be symbolised:—

$$\dot{c}\dot{r}\dot{p}\{(l_p \,.\, d_{pcr}) \cdot (\bar{l}_p \,.\, \bar{d}_{pcr})\},$$

where $d$ is the relative predication "is at a distance from—equal to".

4. Let us symbolise that part of Mill's view of causation, which may be expressed as follows: "Taking *any* phenomenon $m$ there will be found *some* phenomenon $n$ which is such that in *any* instance $e$ in which $m$ appears as antecedent $n$ will appear as consequent". This may be symbolised:—

$$\dot{m}\dot{n}\dot{e}(\bar{a}_{me} \cdot c_{ne}).$$

This is the form required for the Method of Agreement.

5. Let us symbolise that other element in Mill's view of causation, which may be expressed as follows: "Taking *any* phenomenon $n$, *any* instance $e$ in which $n$ appears as

[1] Dr. Mitchell's symbols do not give scope for this distinction.

consequent must have contained *some* phenomenon $m$ as antecedent, which is such that in *any* instance $\epsilon$ in which $m$ appears as antecedent $n$ will appear as consequent". This must be symbolised: —

$$\dot{n}\dot{e}\dot{m}\dot{\epsilon}\{\bar{c}_{n\epsilon} \cdot a_{m\epsilon} \cdot (\bar{a}_{m\epsilon} \cdot c_{n\epsilon})\}.$$

This is the form required in the Method of Difference. It is to be observed that in both formulæ I have allowed for the Plurality of Causes.[1]

6. Lastly, we must observe that all formulæ of a Calculus —such as Algebra or Logic—which involve symbols to be taken in a *universal* sense, are to be interpreted as multiply-quantified propositions of an order equal to the number of universalised symbols involved; *e.g.*, the Binomial Theorem $(a+b)^n = a^n + n.a^{n-1}b + \ldots$ is a triply-quantified proposition, for each of the symbols $a$, $b$ and $n$ here stand for any number whatever. When such formulæ are used for inferential purposes, the *Dictum de omni et nullo* is employed in giving to the general symbols particular values. Or, if we analyse the universals as condensed determinative synthesis, we infer by the formula "$b$ and $c$ implies $c$". We, therefore, are brought round again to the formulæ of Logic with which we started. And we see that the *intelligent* employment of these formulæ exhibits the same principles which are mechanically evolved by the calculus itself.

The final outcome of this method of notation is the same as that adopted at the end of Mr. Peirce's paper on the "Logic of Relatives" in the Johns Hopkins' *Studies in Logic*. It was this paper that led me to represent the subject in the form given. The differences between Mr. Peirce's method and mine are perhaps unessential. He begins by defining the symbol $l_{xy}$ as a *number*. Any complex proposition (see p. 200) may then be expressed by saying that "some complexus of aggregates and products of such numerical coefficients is greater than zero". As, however, the symbol $>0$ terminates all the propositions so symbolised, it may be always omitted. And, finally, "the Boolian calculus is applicable" to all the forms of proposition used. On the other hand, I begin by defining $l_{xy}$ as a (molecular) *proposition*, and immediately combine such propositions on the principles of the Boolian calculus. The difference may be in-

[1] Forms of this kind are necessary to reduce Induction to a (hypothetically) demonstrative process, such as Mill appeared to regard it. But I do not wish to maintain the truth or general applicability of these *particular major premisses* in reference to phenomenal sequences, although I believe they indicate the general nature of Formal Induction.

significant. But I can see no reason for restricting the use of these *molecular* propositions to cases of *relative* predication, since it appears to me that any singly-quantified proposition requires the same reference to moleculars in order to expound the rules for its synthesis with other singly-quantified propositions. Mr. Peirce appears to use this molecular analysis only as a last resource, when his highly ingenious calculus, involving "relative addition and multiplication," breaks down under the increasing complexity of the propositions treated. I should prefer to regard these "relative operations" in the light of condensed forms of the ordinary Boolian addition and multiplication. Thus the proposition "$x$ loves some benefactor of $y$," which involves Mr. Peirce's relative multiplication, would be symbolised $\dot{z}(l_{xz}.b_{zy})$; and the proposition "$x$ loves all but the benefactors of $y$," which involves relative addition, would be symbolised $\dot{z}(l_{xz}+b_{zy})$. In each case $z$ represents the universe, to which reference is made in the words *some* and *all*. From these forms all Mr. Peirce's results may be derived without any departure from the Boolian Calculus. I do not imagine that Mr. Peirce would deny this. But the particular procedure which he adopts *suggests* that the so-called "Logic of Relatives" rests on a foundation independent of the principles of propositional synthesis worked out by Boole. My chief object has been to exhibit the unity of the whole Logical Calculus—including Relative Logic—by showing its dependence on the single group of fundamental laws regulating the pure synthesis and pure negation of propositions.

*(To be Continued.)*

# V.—DISCUSSIONS.

## DR. MÜNSTERBERG AND HIS CRITICS.

By S. Alexander.

Mr. Titchener's article in the October number of Mind for last year will perhaps have thrown grave doubts in the minds of many English readers upon the value of Dr. Münsterberg's work. A criticism which consists mostly of pointing out real or supposed errors of detail, even if successful, is calculated to leave the impression that the whole of the work under review is valueless. Many of his objections refer, indeed, to unimportant points, and the graver theoretical ones are really groundless. No candid reader can however refuse to admit that he, like Prof. G. E. Müller, has indicated real defects in the experimental proof; and that Dr. Münsterberg's inquiries need to be carefully reconsidered and checked both on their experimental and on their theoretical side. But though he professes to do no more, he has done more, and he has contrived to give a one-sided judgment by neglecting the other considerations which give Dr. Münsterberg's work its value. In what follows I hold no brief for Dr. Münsterberg; I desire only to draw attention to the real points at issue, which, I think, Mr. Titchener very often overlooks. No comments would be fair which did not also take account partially of Prof. Müller's criticism, which has much the same general tendency as Mr. Titchener's, and is certainly weighty.

There is no necessity, after all that has been written on Dr. Münsterberg's work, to speak of its general significance. I desire only to record my humble conviction, that, even if the present attacks were more successful than they are, the *Beiträge* remain among the hopefullest psychological work of recent years. They constitute a thoroughgoing attempt to employ experiment with a purpose, as a means of testing introspective analysis, and they have treated the subject with a freedom and a breadth of conception which of themselves entitle the author to the gratitude of students. No one, I suppose, is willing to accept without reservation, or at least without suspense of judgment, the far-reaching significance which Dr. Münsterberg attributes to the muscular sense. Yet here at any rate is a large body of evidence which seems to admit of that interpretation, and part of its strength arises from its mass. True, the very existence, or, at any rate, the effectiveness of a muscle-sense pure and simple, is being called in question. And it is also true that Dr. Münsterberg, while regarding sensations from the muscles, that is, sensations of contraction or strain, as forming only one element in a product to which joints, tendons and skin contribute as well, certainly attaches the position of greatest importance to

the muscle-sense as such.[1] But in so far as we describe the sense of movement as muscular sense (a very incorrect description) evidence accumulated to show its importance remains no less valid whether we interpret the kinæsthesis as mainly an affair of the joints or mainly an affair of muscular strains. And so far as muscular sense means as it should mean the sensation of strain or contraction, here is evidence adduced in favour of its importance. If the 'muscular sense' is treated on a large scale, so too is the issue between association as the main principle of mental combination on the one hand, and something, whatever it is, which is not merely association, on the other hand. For as to attention, which is sometimes put forward as a process distinct from association, the author treats it as a part of the sensory data of mind, and, as I explain below, as following the same law as other sensory data.

I. The first of the studies, which was an attempt to show that the most complicated mental processes were only associative acts, consisted of two parts. In the first part the author claimed to show that acts of choice could be performed in either the sensorial or the muscular form. The method was this. In the sensorial reaction you were told that a word being called, which should be the name of either animal or plant (there were, in fact, five categories), you were to listen attentively to the name, and *if* it was the name of an animal you were to lift your first finger. In the muscular reaction you were told: 'If the name of an animal is called lift your first finger'. In the first case your attention is directed to the word called, and then the rest follows according to the prescription; in the second case you attend to the task of moving your first or second finger according as the

[1] Mr. Titchener does not, I think, accurately represent the state of the case. Dr. Goldscheider himself claims only to have shown that the joint-sensations are decisive for minimal excursions of the limbs. He thinks this probable in large excursions also, but this is certainly not proved. And it is quite premature to say that the muscle-sense has been shown to be ineffectual. What has been shown is that it is not the only factor, and moreover that for sense of *movement* the joint-sensations are of vital importance. It was found that when the sensibility of the joints was suspended by faradisation, the sensibility for movement was greatly diminished, the threshold raised. This does not prove that the muscle-sense is inoperative, for even in passive movements the muscles are contracted, but only that it cannot judge movement without joint-sensations. Now this is just what upon the ordinary theory should be expected, if the joint-sensations supply the place of the tactual sensations of the finger-tip in exploring an irregular surface. Like Prof. Croom Robertson, I find it difficult to conceive how mere sensation of greater or less contraction of the muscles should give us a sensation of *movement*, without help from sensations which can serve as an index of position. Dr. Goldscheider's work appears to me to make this clear for the movement of the limbs themselves as not used in exploration of foreign bodies, and I believe that this would be a reasonable corollary of the usual theory of extension.

name of a plant or animal is called. This distinction being proved experimentally to be possible, what follows? Why, that in any case the choice involves a train of association, but that, as in muscular reaction, attention to the movement to be performed has already set going associations, not only between animal and your second finger, but between animal and the particular animals that are likely to be called, the process of reaction is shortened. And it is not wonderful that, as the principal work is already done before the experiment, the shortened times should be much the same, no matter how the different categories in successive groups rise in difficulty. Whereas, in the other case, the word first has to excite the mass of ideas involved in the prescription to attend to it (has to be apperceived), and then the other associations follow on. The act of so-called apperception is thus one particular kind of association, which may be rendered unnecessary by preparing the mind properly beforehand. Then the second part of the research showed that complicated judgments could be performed in times which did not allow all the operations, conscious and unconscious, to be performed in serial order. They must, therefore, be supposed to overlap, and again the associative process is shown not always to require conscious apperception.

Observe that, apart from details, the very argument implied in the study is this, that the whole process of mental connexion is associative, because if by altering the attention you alter the associations which lie most readily at the disposal of the person, the times of reaction must necessarily be altered, as experiment shows them to do in fact. And in like manner, in pt. ii., the associations excited by the form of the question put must alter the time of answer. Of course it is perfectly legitimate, on the other hand, to say that any one could see this result without the experiments. But it is surely a feature of much of the best experimental work that it puts upon a secure footing, and formulates as a basis for further development, ideas which are known introspectively beforehand.

The importance of the main point made it worth while to go over the ground again. I hope I do not do Mr. Titchener an injustice in saying that he does not appear quite to understand. Else he would not think it a "fatal weakness" in the second part that the process of association should have begun before the last word of a sentence is called. Certainly it does; and this is argued in the interpretation (pp. 173 ff.). This fact may indeed operate unequally in the different questions of any one group—a difficulty met by the number and variety of the questions. Some minor points I refer to in a footnote.[1]

[1] (*a*) On p. 73 of Heft i. there is no contradiction, as Mr. Titchener seems to think (MIND, vol. xvi. p. 522). The two statements he quotes refer to different things: the one to what happened after practice, the other to what happened before practice. (*b*) Can there be any real

As to the experimental proof, I have no doubt that the figures given cannot be regarded as absolutely exact. But though this is so far an imperfection, the figures may be exact enough to support the conclusion which is based upon them; and the faults which can be found with them do not deprive them of their significance in relation to one another. Mr. Titchener does not mention the most important point. The error he speaks of which is due to want of simultaneity between uttering a word and closing the key, even if not constant, could not affect a result running up to $400\sigma$. The real difficulty lies in the following, as Dr. Martius points out. There are five categories blended with the ideas of the movement of corresponding fingers. Now if you happen at the moment to be thinking of the finger and category belonging to the word which happens to be called, the time will be short. If you do not, you must first get your mind away from the idea on which it happens to be employed. How far this is really the fact can be determined only by trial. In a rough trial which I made with keys of a piano, it seemed to me that in order to prevent my mind from wandering over the five alternatives, I must deliberately refrain, and this meant in the result that each finger was strained in anticipation, but the separate ideas of the several categories with their corresponding fingers dropped into the background. There was never any hesitation as to which finger belonged to which category. Perhaps Dr. Münsterberg will give some more information. But at any rate, though the possibility of keeping so many alternatives clear in one's mind is not so perfect as he seems to suggest, the associative preparation exists, and it is from this that the conclusion is drawn.

The explanation of the results as due to automatic co-ordination (MIND, vol. xvi. p. 523) is quite impossible. One set of figures was indeed expressly excluded, because they might possibly depend on such co-ordination. But here the same five words (five cases of *lupus*) were repeated, and the same word recurred many times. This was guarded against in the subsequent experiments, and no word repeated. Automatic co-ordination would not explain why the sensorial times kept on increasing in the successive groups, while the muscular times remained constant. The only automatic co-ordination that existed, so far as I can see, was that of category and finger, and this co-ordination was necessary for the experiment. Here again the point seems to have been missed. This co-ordination cannot affect the question whether the choice-reactions were automatic. How can you

doubt as to which finger the experimentee intended to move, either in the mind of himself or of the experimenter? (*c*) Mr. Titchener objects to the large proportion of false reactions. But these false reactions always occur in the muscular method. The large number of them here shows how difficult the act is, not that the method (which seems the only one available) is useless. His explanation that the mistakes are due to imperfect practice contradicts his view that the constancy of the muscular reactions is due to perfect practice.

have automatic co-ordination, when the words which were called were called only once? Of course, the extent to which particular words have become favourites of the person reacting, from education or occupation, does affect the question. But it applies equally to the sensorial reactions. The suggestion which is made by Dr. Götz Martius in his article, that the constancy of the shorter time in all the groups may be due to practice, does not seem likely. Even if all the "sensorial" reactions in each group came together at the first, and the "muscular" ones after them, yet the questions, as shown by the sensorial times, are of increasing difficulty. Moreover, the explanation of the constancy is easy. What makes the sensorial reactions differ is the difficulty of the question put. But in the muscular reactions this inequality is removed, because the difficulty is overcome before the reaction takes place.

II. It is fortunately not necessary to be so long with regard to the paper on the sense of Time. The explanation there given is that we measure time by the waxing and waning of muscular sensation. An interval being begun by an impression, the accompanying muscular sensations, strong at first, decline from this moment, and then begin again to increase with the expectation of the impression which is to conclude the interval. Accordingly a second interval will be judged equal which ends at the same phase in the upward movement of the strain. If we assume that attention is dependent chiefly on the sensations of muscular strain involved in the fixation of a mental state, we can express the theorem of the essay by saying that it is the rhythm of the attention which is an index to the length of time. The author, by an introspective analysis of the muscular accompaniments of a time-impression, concluded that the chief modifying element was the breathing, and he endeavoured to prove his thesis by showing that error in judgment of the equality of two times greatly diminished when the limits of the intervals always coincided with the same phase of respiration.

The principal difficulties urged against the work (besides complaint[1] of the inadequate report of the experiments) are of a theoretical character. One which is strongly urged by Prof. Müller, and also in another place by Mr. Titchener (MIND, p. 533), may be deferred till I speak of the last of the researches, that on the Intensity of Sensations. It is in substance that the sensations of strain, the varying intensities of which are declared in the study on time to be the basis of our measurement of time, are in the later study declared never to vary in intensity at all. This would be indeed serious, if it were well founded, as I shall point out it is not. The other theoretical objection is also at first sight serious and raises an important point. I will quote the

[1] Mr. Titchener's remark (p. 524) that the hammer used in the experiments takes time to fall is perfectly true. But the error is a constant one and does not affect the result.

words. "We are expressly told that the direction of the attention upon a period of time is nothing more than the consciousness of our sensations of strain, and of the alterations in their intensity during that period, yet the attention is focussed upon these sensations of strain in order that we may measure the time. Worse than this, the act of attention is itself explained by means of muscular sensations: so that we somehow manage to concentrate a sensation of strain upon another sensation of strain." All these sentences raise, I suppose, the same difficulty, but it vanishes after a little reflexion, and arises apparently from the phrase 'directing or concentrating the attention upon' something, which seems to suggest that the attention is a glass turned on to an object, instead of merely an accompanying state of mind. 'The concentration of attention' (regarded as itself a sensation of strain) 'upon a sensation of strain' is a phrase which describes that the sensations of strain are uppermost and that sensations likely to divert from them are actively suppressed. When at this moment I wish to attend to a strain of muscle in my arm, I feel that sensation distinctly, and I feel also other strains both in the arms and in my eyes and head. To attend to a muscular strain is to have it, and to take the necessary measures to keep it. This is explained by Dr. Münsterberg himself on p. 25 of his essay. "'Our attention turns to the sensations of strain' means of course only this. The intention to measure the interval of time, and the other circumstances of the experiment supply the psychophysical conditions in consequence of which the perception of the sensations of strain increases in clearness, everything else in our consciousness recedes, and by secondary fixation of our organs we, as it were, turn ourselves towards the strained organ."[1]

VI. Perhaps it will be well to desert the order of the essays and pass on to the research on the Intensity of Sensations (pt. iii. of the *Beiträge*), because of the supposed inconsistency between its view of muscular sensations and the expressions used about them in the study on time, and it may be added, in the whole of the rest of the book. The theory which the author advances is that the intensity of sensations is measured not by anything in the sensation in itself, which varies only in quality, but by the accompanying, or let us say implicated muscular sensations which vary only in quantity and not in quality. I should be as audacious as Dr. Münsterberg himself if I

[1] One small matter. Why does Mr. Titchener think it strange that a pause in which there are no sensations of strain should be timeless? His remark where it stands is not to the point, for Dr. Münsterberg is speaking not of 'a pause,' but of 'the pause' between the expiration and the inspiration, and says that if an impression falls within that pause you are at a loss to fix its place in time. But how should we *experience* time in a pause if the attention were suspended? The pause could only be measured by the clock. But we are not investigating what may be called objective time, but the sense of it.

regarded this theory as sufficiently proved. The experiments which tend to show that intervals between pairs of impression derived from different senses can be compared, as ought to be possible if intensity is but muscular strain, are put forward only as provisional, and they are not numerous and varied enough to be conclusive. The theory itself I regard as a hypothesis, one which if it could be justified would constitute an immense simplification in psychology, and one which has much in its favour, and is as I think untouched by the theoretical objections which I have seen. The point from which it proceeds is certainly of great importance, namely, that (to speak only of the five senses) a change of intensity really means a new kind of sensation, and you cannot add sensations together—you cannot say a low sound is part of a loud sound of the same pitch, or that a slightly sweet sensation is part of a very sweet sensation. Now this study attempts to supply an explanation of how, in spite of the qualitative difference of all sensations, it is still possible to measure their difference quantitatively. The muscular sensations are held to occupy an exceptional position. As sensations they are always the same in quality, and a smaller muscular sensation really is contained in a larger one—you can pass from a muscular strain *ab* to a strain *abc* by adding on the difference *c*. One fact to which allusion is made as rendering this assertion necessary is that in judging weights it is indifferent from which position of the forearm we start in weighing and yet the arm may start with a considerable muscular contraction. This certainly does seem to indicate that the mere change in the muscular strain, the mere addition to the sensation, is felt and serves to measure the weight.

Now comes the objector and declares this view of muscular sensation as being always the same sensation and varying only in its duration and extent (in time and space) to be opposed to all other assertions about it. But this is a misunderstanding. It seems to be thought that a large muscular strain would not be felt *differently* from a small one. This would be a monstrous assertion to make. But what is meant is not that muscular sensations cannot be distinguished, but that though it is always one and the same sensation there may be more or less of it. Muscular sensations may be properly spoken of as varying in intensity, provided we do not suppose that their intensity is the same kind of thing as the intensity of sound or light sensations, which is a difference of quality. In the case of these ordinary sensations, too, it would be absurd to say that intensity is abolished because it is explained. The case may be illustrated thus: we may have two pears each weighing a quarter of a pound, and another of the same kind which weighs half a pound. The larger pear is quite different qualitatively from the small ones; it is probably more luscious, is certainly more interesting, and will cost more. You cannot get the same kind of satisfaction from the two small ones as from it. But so far as weight of pear is concerned the two

small ones are every bit as good, and the unit by which its weight is measured is the single small pear.

Thus the muscular sensations differ in being different multiples of the same unit. They are described as differing in respect of time because any given muscular sensation may be produced by adding several units together successively. The sensation accompanying a large contraction of the biceps differs from that of a smaller contraction because more units of "strain" have been added. They are described as differing in respect of space because (at least I suppose this is the meaning though it is not clear) of the area over which the sensation extends. And with this explanation the apparent objection appears to me to fall to the ground.

The other objection of circularity in argument which Mr. Titchener borrows from Dr. Martius is very easily disposed of, like most objections from circularity. How, it is asked, can muscle-sensations which are already different in respect of time and space be used to measure intensity, when it is only through them that we know time and space? How, I ask, could we know time and space by muscle-sensations if those sensations were *not* already different in time and space? Of course the objector confuses between time as measured by the clock, and the sense of time as dependent on muscular sensation. It is not asserted that in a greater muscular strain you necessarily have the *sense* of longer time; for that you would need to attend to the change in the amount of the sensation. The theory that muscular sensations are the basis of our measurement of intensity is so far from being inconsistent with the theory of the time sense, that it corroborates that theory. If muscle-sensations differ in strength according to their objective duration, how should duration be better observed than by attending to the variations in the strength of these sensations? [1]

Another objection raised is that if the theory were true, all sensations should form a single intensive series. This is perfectly right. There would, if I understand rightly, be a single series, but there would be many qualitatively distinct sensations at each point. The various sensations would form a column five deep. That as a matter of fact we are not in the habit of comparing disparate impressions, equating a definite loudness of sound to a definite brightness of light, proves nothing against the possibility of so comparing them, because the comparison serves no practical purpose. There is no direct comparability between drinking a bottle of champagne and listening to Herr Joachim; yet, our practical interests being appealed to, we compare the amount of

[1] As to the assertion that the sensations differ in respect of space there is some obscurity. Elsewhere (p. 32) Dr. Münsterberg speaks of "the duration of the strain and the range of its extension (Umfang ihrer Ausbreitung)". Does this mean simply the inclusion of more muscles? Elsewhere (p. 33) he speaks of its "encroachment on neighbouring areas".

enjoyment they give us, and may equate them by spending ten shillings for either. The reason assigned by the objector to show that there is no single intensive series is the arbitrary starting-point from which the intervals were measured. Now, in the first place, the starting-points were not arbitrary. Dr. Münsterberg says that he chose as starting-points sensations which on the ground of practice in such estimation seemed to him equal, "not to prejudge the matter by saying that they called forth equal impressions of strain" (Heft iii. p. 71). But, in the second place, supposing the starting-points were quite arbitrary, this would not affect the question. The object was to ascertain whether intensive relations of disparate impressions could be estimated in any regular way, as should be the case if intensive change was always measured by addition to the secondary strains. To have set about comparing different single impressions directly would have added enormously to the difficulty. But now supposing the ultimate theory to be true, then no matter what starting-points were taken the resulting law should not be affected; though of course the actual numerical additions to the *stimuli* would have been altered. It is not impossible that there may be some confusion between the intensity of the sensation and the amount of the objective stimulus lying at the basis of the objection.

Though I cannot regard the theory as at present more than a hypothesis awaiting more exact and extensive verification, I think it worth while to point out that it contains no inherent contradiction, and that it is a theory which, while it raises difficulties,[1] well deserves further work, all the more because of its extreme audacity. Criticisms of the kind which I have been considering are apt if unanswered to cut off interest in the matter. As for the solution which is offered by Dr. Münsterberg's opponents of the experimental results, that the intervals between pairs of disparate sensations are judged equal by the mind's estimating the number of perceivably different sensations which can be found in each interval, this seems to me questionable in the extreme. There would be something to be said for this interpretation if the intervals had been taken in regular order. Even then we are assuming a power of mental arithmetic which seems incredible. And as the intervals are not taken in any regular order I am unable to imagine it at all. The more audacious theory appears to me much the more natural.

III. The other researches, III., IV., and V., are of a more special character. They all tend to magnify the muscular sense. About IV., the study of measurements by the eye, I have nothing to say. Dr. Münsterberg must settle with Prof. Müller whether his method is wrong; and on III., which deals with the

[1] One of the questions raised by it is how far we can distinguish between the effect of the natural intensity of a sensation upon the muscles, and of the attention.

oscillations of attention, and V., which discusses the determination of direction by the ear, I feel some hesitation in pronouncing an opinion, owing to the special character of the investigations. In neither case is it the experiments themselves which are questioned, but the theoretical interpretation of them. The experiments themselves supply valuable material which must be reckoned with. In the study of oscillations of attention the usual grey ring just distinguishable on a white disc appeared to vanish and then reappear. By introducing at intervals various motions of the eye, making the observer sharply close the eyelids, interposing prismatic glasses, moving a grey disc in front of the eyes, the time between two disappearances was made to vary. The investigator concluded that the oscillations were due to fatigue in the eye muscles; the fatigue leads to an alteration either of the fixation or the accommodation or both; the grey ring vanishes; the muscles then recover, return to their duties, and the grey ring reappears. The critics have, I think, given Dr. Münsterberg in respect of this article some very shrewd blows indeed. But though I cannot see any answer to some of their criticism of individual links in the chain of his reasoning, I can by no means think that his explanation is disposed of. One thing the experiments seem to demonstrate, that the phenomenon is intimately connected with eye-movements (using this term to include alterations of the lens, as well as movements of the whole eye). Mr. Titchener's remarks are not clear to me. Has he demonstrated that no movements actually take place at all, as he seems to suggest? If so, I can see no other explanation than that of Herr N. Lange (the original investigator of the subject—*Phil. Stud.* iv.) that the phenomenon is central, a case of the general law of psychical relativity; and this I confess I do not well understand, until it is also shown what are the actual variations which take place in the psychological or physiological complex indicated by the term 'central'. Nor again does this explanation account for the new experiments. But a still greater difficulty would be the actual feelings of movement in the eye, which in my own case are very marked. The observation is easy to make and does not require a revolving disc. A pin-head on a black surface or a small strip of colour on a ground slightly lighter or darker serves the purpose perfectly well. I felt a movement of divergence when the object vanished and of convergence when it reappeared, like the movements noticed in the well-known puzzle diagrams which change their relief at intervals.

The question at issue is whether the ring disappears because the attention cannot bear the strain required for seeing, or because there is nothing to see. Is the exhaustion of the organ or of the muscles? That there is a great strain of the muscles required in order to keep the eye so intent on the dimmer colour that it perceives the distinction of this colour from the background is plain, and it is natural therefore that any relaxation of the

muscles should make a difference to the eye's sensitiveness under the conditions of the experiment. Dr. Münsterberg holds that the fatigue of the eye brings the difference of the grey ring and its background under the threshold of difference both by altering the accommodation and by moving the eye. As to this second point his reasoning has, I think, been proved fallacious. But the failure of accommodation is sufficient. It is hazardous to argue that when the eye swerves aside the difference of stimulus may still be apprehended by the more excitable peripheral spot upon which the grey now falls. In the passage of Helmholtz referred to (*Phys. Optik*, p. 315)[1] it is pointed out that though we can sometimes see indirectly a difference not perceptible directly, this does not happen at once but only after some time of attentive consideration. And here the attention is relaxed.

To suppose that the phenomenon is merely sensorial is open to the objection that whether the eye moves or remains still the stimulus persists; how should the organ recover? This is an objection to the theory thrown out (merely as a suggestion) by Prof. Müller, that the sensitiveness of the eye being reduced by the stimulus, the muscles move the eye by a reflex supervening upon this sensory exhaustion, and that the movement, by altering the pressure in the blood-vessels, restores the sensitiveness of the eye, as investigations by Messrs. Fick and Gürber, which he quotes, seem to show that it does. For though the movement may thus be beneficial, the fovea is still turned on to the white disc, and exposed to an even greater stimulus than before.[2] Nor do I see how this idea would explain the fact that when a grey card is moved in front of the revolving disc at intervals the ring disappears more quickly than before. For the movement of the eye must so far restore the sensitiveness, and the grey card does not excite more than the grey ring. Whereas the additional strain of the muscles in fixing, in spite of the inclination to follow the moving card, will very well explain the phenomenon.

On the other hand, the theory of muscular fatigue, though it does not seem able without further verification to account definitively for the disappearance of the ring (which might be due to exhaustion of the sensitiveness of the retina due to changes in the circulation), is able to account for the recovery of the eye's sensitiveness and for all the other experimental facts. The criticism passed upon Dr. Münsterberg's assumption that fatigue of the muscles acts itself as a signal to the contraction of antagonist muscles, does not seem to me very serious. All that is meant is, I suppose, that when you are tired of keeping your

[1] Of course the greater sensibility of the moving eye will explain, as Mr. Titchener says, some of the experimental results. But it only restates them, and is itself in need of explanation.

[2] This would not, of course, apply to the case of a lighter object on dark background.

muscles contracted you unbend them, as you stretch the arm after exercising the biceps.

It appears to me, then, that a case, though by no means a conclusive one, has been made out for supposing the muscular strain to be the chief factor in the production of the phenomena. But I have dwelt so long upon these points because the possibility that the state of the blood-vessels may be the determining factor (apart from change in the retina itself) makes it natural to say that here is a very important case in which to try the question, What is the relative proportion of the state of the circulation and the state of the muscles in determining the attention? This subject appears to be of the utmost importance at the present moment, and to be making a larger and larger claim. The recent work of Dr. Alfred Lehmann on Hypnotism (*Die Hypnose*, noticed in MIND, No. 63, by the present Editor) has revived the theory that the state of the circulation is really the chief or the only condition of attention itself.

V. It remains to comment on the study of Localisation by the Ear, which was certainly a fascinating piece of work, because it seemed to place the ears in the same position for apprehending direction in space as the eyes and hands for apprehending place. Dr. Münsterberg tackled the question by tracing how the sensibility to change of direction changes at different points of the compass on three different circles, of which the middle point between the two ears was the centre. The circles were chosen in three planes: one the horizontal through the tympana, the other the median vertical (or sagittal), the third the frontal at right angles to both the first two. By considering what different sets of muscles were engaged at the different positions and in what proportions, he concluded that the ear determined the direction of sound by the perception of the movements of the head required to bring the ears into the position of distinctest hearing, that is, with the sound straight in front. In the same way the popular theory of localisation by the eye holds that the direction of a visible object is determined by the sense of the movement of the eye necessary to see the object with the point of distinctest vision. The stimulus to these movements Dr. Münsterberg, following out and improving upon a theory of Prof. Preyer's, finds in the different distribution of the impact of the sound waves on the semi-circular canals.

Mr. Titchener points out that the three circles cut one another in various points, and yet the thresholds are very different at the same point according as it is regarded as belonging to one circle or the other, and he adds that the strains cannot differ so much at identical points. But if he will carefully go through his formidable-looking equations, and will consider what Dr. Münsterberg has shown at length, that according as the head is moving in one circle or the other the strains are very differently disposed, his objection will mostly disappear, pending

at least the control of the figures by experiments performed on other individuals. Thus, for instance, at 90° in the horizontal circle, the threshold is an angle measured approximately by an arc of 7·5 cm. on a circle of radius 1 meter. In the frontal vertical circle at the same point it is only 2 cm. But the strain in the horizontal direction is very great, that in the vertical practically nil; it is natural therefore that the threshold of difference in the horizontal circle should be large and in the other small.

A more serious objection is that the results are explainable by the usual theory that direction is determined by the relative intensity of the impressions on the two ears. Prof. Müller points out that owing to the shape and position of the shell of the ear this ratio changes less rapidly the further the sound moves to the back, and the thresholds would naturally increase in the horizontal circle from before backwards. That this is insufficient seems proved by the fact that the ratio changes from a maximum at 90° to unity at 180° just as it changes from unity at 0° to a maximum at 90°, that is, in a quarter of the circle. But the experimental figures show that the threshold rises continually, that is, according to this interpretation the rate of change of the ratio in the second quadrant is slower and slower, and yet the ratio arrives at unity in the space of a quadrant. Mr. Titchener's objection is different: that the change in the intensity of the impression was taken (under the conditions of the experiment) for a change of direction, which was what the subject expected. This is of course only a possibility, and it does not explain why in the one-ear experiments the thresholds are higher on the side of the good ear than in the two-ear experiments performed on the same individual.[1] For in both cases the absolute intensity changes as soon. The reason must lie in the relative intensity, and then the other difficulty arises.

It must be admitted that a great deal more remains to be done before Dr. Münsterberg proves his point. Yet, so far as I can see, the experiments indicate some other cause than that assigned by the usual theory. In fact, that theory is not in any case final. For we could then determine direction only by experience derived from touch and sight, experience that when a sound has struck the two ears with a particular relative difference it has come in a particular direction. Now it is just this further question upon which Dr. Münsterberg's method and interpretation begin to throw light; because they attempt to show the existence of a special measuring instrument for auditory space, and to answer the question why we instinctively turn our heads towards the source of a sound. It is perfectly true that the way in which, physically, the different directions of sound can affect the canals is not explained. Yet fishes, to which

[1] Why does Mr. Titchener say (p. 528, note) that the threshold at 90° should be greater in the one-ear experiments than at 180°?

direction of sound must be important, have canals and no cochlea; and besides this we have the connexion of the canals with head movement and the instinctive movement just mentioned. The links have yet to be indicated. Prof. Breuer himself, to whom Mr. Titchener refers in a note, contemplates a theory not unlike that of Dr. Münsterberg's, while fully admitting that the physical conditions are unexplained. He conceives it as just possible that future inquiry might show that the elasticity of the temporal bone is different in three different planes. But no one will pretend that the connexion is made out as yet.

Into the question whether the apperception-theory attacked by Dr. Münsterberg is identical with the theory of Prof. Wundt, I have no intention of entering. No such discussion would affect the question of real scientific interest, whether the theory offered in opposition (not a new theory, be it observed, but an extension of an old one) is right, whether it succeeds in interpreting the facts. And such a discussion would mean a great many pages of criticism, partly literary, for which I have no inclination. Nor should I have attempted to deal at all with a subject on which I have no claim to speak as an expert, did I not feel it desirable as a learner to get the questions at issue clearly before my own mind and those of other persons. The impression left upon me both by Prof. Müller's and Mr. Titchener's criticism is that it proves too much. The writers have done a service where they have pointed out real errors, and where they render suspense of judgment or reconsideration necessary. But they would have done a greater service if they had also done more justice to the meaning and the originality of their author's work, both on its experimental and on its theoretical side. The new prospects which that work seemed to offer in the subject constituted its attraction for me; and I still respectfully maintain my opinion of its value.

S. ALEXANDER.

## VI.—CRITICAL NOTICES.

*Logik.* Von BENNO ERDMANN. Erster Band, Logische Elementarlehre. Halle: Max Niemeyer, 1892. Pp. xv., 632.

The volume before us contains, we may suppose, all the decisive factors of the author's logical theory. As "doctrine of the elements of thought" it contains an account of the objects with which thinking is concerned, and also of judgment and of reasoning both deductive and inductive (p. 31). The second part of universal logic consists of the general methodology of science (*ib.*), and is reserved for the second volume of the present work. The study of special methods peculiar to the special branches of science does not fall within the province of logic as such, but is a technical supplement to the separate sciences. Sir John Herschel's "Preliminary Discourse on the Study of Natural Philosophy" is referred to as a model of such "technical methodology". The author does not include this within his scheme.

In a short Introduction (34 pp.) the relation of Logic to other mental sciences is laid down. Metaphysic (taken as one and the same science with "Erkenntniss-Theorie," p. 11) deals with the material presuppositions of scientific thought; Logic with its formal presuppositions (the existence and value of Judgment, Induction, Deduction, and the like). Psychology deals with processes in consciousness and their connexions according to law; Logic treats of truth and probability as properties of predication *qua* issuing from the relations of perceived or thought content ("aus den Beziehungen des Vorgestellten," p. 18). But yet Logic builds on Psychology, in so far as we must know what a judgment is before we can tell how to frame our demands upon it. "The theory of abstraction from Socrates to Locke, too often represented in our own formal logic, shows the danger of ignoring psychological fact in logical doctrine." Much the same is the relation between logic and grammar. Thinking in the narrower sense (as = Judgment, p. 5) develops *pari passu* with language, though perception, and the train of memory, can go on without words. In connecting words with thinking, we must bear in mind that words for this purpose are the actual images or remembered ideas of words, whether visual or auditory. But for all this logic is not universal grammar. Grammar is moulded by practical needs. It develops what is not essential to logic and omits much that is. Only as a storehouse of intellectual results it enters into the material of Logic (pp. 29-30).

After this Introduction, book i., forming about a quarter of the volume, is devoted to the Objects of Thought, under the

influence, it appears to me, of Mill's discussions upon the "Things Denoted by Names". As "Vorstellen" includes all contents of consciousness of which we are aware as objects, this discussion coincides with a treatment of "Vorstellungen". These, it will be observed, are on the whole regarded as prior to Judgment.

In this discussion "objects of the first order" are the content of perceptions which by the action of appercipient masses and through a process of positive and negative abstraction (pp. 42-44) have come to be regarded as single or individual objects, whether real or ideal, concrete or abstract. In contrast with them the author treats as "objects of the second order" systems or aggregates which are held together by the uniformity of the relations between their members (pp. 100-101). The term "Inbegriffe" ("totalities" "aggregates" or "manifolds") is expressly applied by the author to objects of this class, of which a section of space, a portion of a landscape, or a material body regarded as a complex of atoms, are given as examples. As discrete, these manifolds are *collective*, and are represented by such instances as the series of positive whole numbers, which is quite independent of the existence of real numerable objects, and by legal or juristic "persons," *i.e.*, corporations or institutions. As continuous, the "totalities" are represented by the system of number, considered from the standpoint of modern mathematics as capable of embodying continuity.

The second portion of the first book treats of the logical relations of the objects of thought. The chief of these is the relation of Genus and Species, with the accompanying properties of Extension and Intension. It is noticeable that the author finds a meaning for "contradictory" and "contrary" within the relations of species among each other, and apart from any framing by the judgment. The treatment of Intension and Extension (Content and Area, "Inhalt" and "Umfang") presents no novelty, although a crude application of the pyramidal arrangement is perhaps intentionally excluded by the words "in comparison with the less connotative members of the series" inserted in the ordinary statement that the greater the intension the less the extension (p. 153). There would thus be no contradiction in assigning to the genus the same content as to the species. The arithmetical phraseology of the "inverse ratio" is rightly rejected (p. 154). But the subsumptive basis of the pyramidal arrangement is as a whole accepted.

In the concluding chapter of the first book we have a novelty indeed. The law of Identity is set down as the law of perception or idea (Vorstellen). And as such a law it is taken to represent the fruitless effort to express "idea" (Vorstellen) in Judgment. It is understood as the limiting case of relation—a relation whose terms are not distinguishable, and therefore form

no relation at all. Partial Identity is inconceivable. *There is no identity but this self-identity*, which, excluding all continuity (for what is presented a second time is not identical with what was presented before (p. 174)), must, so far as I can understand, be absolutely atomic. Identity is thus simply "position". It repudiates all intelligible attribution. It is pure momentary being. By such an interpretation Identity is utterly swept out of the region of Logic. The result is not fatal, so far as I can see, because the author seems to use "Gleichheit," sharply distinguished from "Ähnlichkeit," where the work of identity in binding the different together has to be named. The question thus becomes verbal. As a synthetic consequence of the law of Identity the author lays down the law of non-identity. "Every object, so far as identical only with itself, is different from every other" (p. 175). "And from itself" needs, I think, to be added, as there is no self which does not include differences.

The author, however, had a distinct purpose in throwing so much of his object-matter into the class of "Vorstellen" and below the synthetic activity—which he does not admit to be synthetic—of judgment. The nature of this purpose we shall see in his theory of judgment. By way of transition, he points out that ideas tend to pass into judgment both by our tendency to refer marks through the aid of word-presentations to an object in course of realisation, and by the condensation of judgments into complex word-meanings which, in actual consciousness, only exist as judgments. Such word-meanings are the "notions" (Begriffe) of traditional logic (p. 184).

The leading ideas of the author's theory of judgment appear to be two. First, Judgment *is* predication as against the existential theory (p. 187); secondly, Predication is more than—is, so to speak, on the top of—presentation or idea (Vorstellen). Psychology tells us that the object is given *before* enunciation takes place (p. 208); the judgment of perception and experience is merely the predicative expression of an extension which *has already taken place* in "Vorstellung". Now we see why "Vorstellung" had a first part of logic and an elaborate analysis to itself. It, in fact, does the work; Judgment comes after and stamps it for expressional use. There can be no synthetic judgment of perception or of experience (p. 211). This is supported by a careful analysis of the apperceptive process by which a new property is observed in perception or generalised in experience.

Thus the separation of Subject and Predicate in language indicates no separation of their meanings in thought, but, on the contrary, "logical immanence of the predicated content in the Subject" (p. 221). The "Vorgestelltes" is not severed in the Judgment, but preserved. This unity of the content in Judgment seems to be the idea in Ploucquet

which has fascinated the author, as I judge from a quotation (p. 222).

Passing from the evidence of Psychology and Grammar, we come to the Logical theory of Judgment. Theories of Judgment are divided into Extension-theories and Intension-theories or Content-theories (p. 246). Extension-theories include the Subsumption-theory and the Identity-theory (p. 252), of which the Quantification-theory is taken as a form. This Identity-theory is not that of Jevons, but essentially depends on Quantification. Intension-theories include Jevons' identity-theory (this classification surprises me), Lotze's thorough-going determination of S by P (p. 259), and the author's theory. According to this (p. 262) "the judgment is the placing ('Einordnung') of one object in the content of another, performed by means of the proposition, conditioned by identity of content ('Inhaltsgleichheit'), and represented ('Vorgestellt') in logical immanence". The Subject is that element of content in the Judgment *in* which a place is found, the Predicate that *for* which a place is found. The copula (see p. 189) is the conjunction or relation of the two, and cannot be expressed in language without the inclusion of both. In "The dead ride fast" the copula can only be otherwise expressed by "The fast riding of the dead". That is to say, it is such a relation as exists only when this predicate is placed in this subject.

In harmony with this analysis, and in lieu of the Law of Identity, we have the principle of affirmation or of Logical Identity ("der logischen Gleichheit"): "An object can only be predicated of another in so far as its content can be placed (eingeordnet) in the content of that other" (p. 266). From this arise two corollaries: (*a*) The law of agreement, *viz.*, that an object is "gleich" to itself when repeated in thought (p. 269); and (*b*) Objects that are "gleich" can be substituted for each other.

The validity of judgments is now discussed, and questions are admitted as a class of judgments without validity. A fully valid judgment is one of which the object is certain (gewiss) and the enunciation necessary in thought. Certainty, for logic, is derived from repeated identical (gleich) cognition or apperception (p. 272). There are judgments of subjective and of objective certainty, called in brief subjective and objective judgments. The difference between them lies in the consensus of judgments, and both are therefore ultimately reducible to subjective validity (p. 274).

On the basis of this view, which analyses the consciousness of validity in judgment into Certainty and Necessity (p. 282), the author criticises what may be described as existential theories of Judgment or as theories of assent. These he finds led up to by Hamilton (p. 285), and fully developed by Brentano, by the side of whose doctrine he adduces Mr. Bain's connexion of belief with

the "power which an idea has obtained over the will". He does not seem to see any prospect of combining the existential with the predicative value of judgment, and on the ground of the latter he rejects the former (pp. 289-90).

The remainder of the discussion of Judgments is occupied with their classification. They are divided into Real and Ideal; the meaning of the latter is, I think, a novelty, being taken to include the judgment "ought" by predicating its content *as a fact, of a subject regarded in an ideal light* (pp. 314-319); and into Judgments of Extension and Judgments of Intension. Reflective Judgments (Beurtheilungen) are taken as a further class, including negation and modality. The negative Judgment is, therefore, as in Sigwart, the denial of an existing affirmation; and this doctrine is subsequently applied, as in Sigwart, to explain the process of double negation—a very doubtful expedient. It is noticeable that the author is obliged to maintain that no judgment of perception can be negative (p. 359), that is to say, he deals only with "bare negation".

In the theory of Inference the traditional Syllogism is on the whole maintained in its place as the centre of reasoning, being treated *after* the Hypothetical Syllogism which, as a mere affirmation of an element in the major premiss, comes next after immediate inference.

The distinction between Syllogism in the stricter sense, and Syllogism in the sense that includes Induction, is found in the difference between the relations of the element common to the premisses with those elements which are not common to them. In Deduction the common element drops out, and leaves a relation between the two elements which are not common; in Induction the common element remains and enters upon a new relation to the elements which are not common (p. 491). By pronouncing omission of the middle term needless in Syllogism we should destroy this distinction. The traditional Syllogistic forms are given at some length and call for no remark.

There is a curious defence of the syllogism against Mill's criticism of it as a *petitio principii*, in the case of inductive premisses, by distinguishing the "registering" from the "inductive" element in the major premiss, and exhibiting the conclusion as issuing not from the former but from the latter (p. 558). The distinction as drawn seems to me a lax one, for we surely do not know except by inference that all men up to this generation have died; yet this is the element in the major "All men are mortal" which the author sets down as "registered". I do not, therefore, see that the author's analysis adds anything to the ordinary view that the major premiss, in subsumptive Syllogism, shows the operation of the reason by which we draw the conclusion.

The general account of Induction is couched in symbols which allow of only two kinds of terms in each argument—

$S_1$[1] is G, or G is $P_1$,
$S_2$ is G, G is $P_2$,

but permit the premisses to extend to any number. Therefore, as it seems to me, there is from the beginning no adequate allowance for the transformation of content by analysis, and the problem takes a set towards the inference from many to all, which it cannot shake off. And so we find the principle of Induction "like causes produce like effects" supplemented by the material postulate, which in truth has to do only with the degree of realisation of human purposes, that like causes will in fact be found (p. 578). Stated as the fundamental principle of Induction, this takes us at once into questions of probability and the number of unanalysed instances, and distracts us from the task of analysing our cases so as to make sure that we can adequately distinguish the "like" causal relation, if it shall recur in our experience. Induction does not, in fact, tell us *that* this causal relation will recur; it only ensures that we shall recognise it if it does recur "In *these* cases the causes are like," we know from the law of Causation. How many of these cases there will be, no power can predict. Therefore the part played in Induction by number of instances is, in my opinion, wholly misconceived (p. 605), and Induction is separated from all existing precise knowledge and restricted to what can be done by instances *de novo*. But the moment that, in working thus *de novo*, it reaches a scientific stage, the single observation will again become capable of giving a conclusion, and therefore to deny that it is so capable is to deny that Induction should be called Induction when it becomes a scientific method. At this point the question becomes verbal. It is remarkable that the author himself is forced by his view to say that "pure conclusions by induction become rarer, as our knowledge is more developed" (p. 606). He will not admit Induction to be an inverse process of Deduction, and in this he appears to be technically right. It is not, I should have thought, related as division to multiplication, but rather as the establishment of the unit or the numerical series to either of these complete arithmetical processes.

To sum up, the unity of the object in judgment is the essence of the author's theory, and is, I believe, a primary truth of logic. The author is also thoroughly clear that relations in Judgment are not relations between ideas, but relations within ideal wholes. His view of the copula is new to me, and emphasises this unity. The sharp distinction of the judgment from apperception and

[1] $S_1$, &c., are taken as species represented by individuals; $P_1$, &c., as predicates. The conclusion in the first case is from instances to a common property; in the second, from properties to remaining properties.

presentation, together with the total repudiation of reference to reality outside the subject of judgment, appears more doubtful. With these features are connected the strong antagonism to existential theories of the judgment. I should have hoped that on this question a *via media* might have been found. The total refusal to consider whether a categorical judgment involves the reality of its subject (p. 418) seems unjustifiable in the face of recent speculation in England. The treatment of the Existential Judgment does not wholly make up for this (p. 310).

It is doubtful whether the author's own theory of judgment and reasoning really falls outside subsumption. It is entirely within the relation of subject and attribute, and the arguments from construction, in which a major premiss is admittedly superfluous, are not considered at all.

The classification of Judgments is not progressive, but to a great extent a cross division, and the separation between Extensional and Intensional Judgment appears unreal.

Probably the most valuable part of the work except the immediate account of judgment is the analysis of apperception and positive and negative abstraction as furthered by the influence of language. The conceptions of "abstract objects" could hardly come into existence apart from the ideas of words, which alone call attention to the organised relations of such systems (pp. 53 ff.).

It is not likely that I have done complete justice to this valuable treatise. It is plainly full of all kinds of knowledge and suggestion, but the novelties in it strike a reader at first with a certain air of perversity, which a longer acquaintance might remove. Was it worth while, for example, to say that the subject determines the predicate, and not the predicate the subject (p. 251)? The saying impresses us with the unity of the object about which we judge, and this is the author's aim. But has it not always been obvious that the determination must be reciprocal?

The work belongs to the German reaction, and shares with it the dread of system, the love of psychological learning and minute distinction, the excellent common-sense, critical sagacity and freedom from traditional bias, characteristic of the writers who are taking to pieces the work of the great idealists. As, however, we are proud to find that Jevons and Mill return upon us from Germany, perhaps a German thinker may not be altogether horrified if an English reviewer expresses the conviction that the present movement is doing little more than translating Kant and Hegel piecemeal into a more modern terminology. I do not think that in the appreciation of true logical form we are at any point very far in advance of Hegel—though some definite steps have undoubtedly been made—while in our insight into the spirit and essential connexion of the different forms I am sure that we are still behind him.

BERNARD BOSANQUET.

*Handbook of Psychology: Feeling and Will.* By J. M. BALDWIN, Professor in the University of Toronto. London: Macmillan & Co., 1891. Pp. 394.

This volume completes the Handbook of Psychology, the first part of which, on the Senses and Intellect, has already reached a second edition. It is to be regretted that the first volume has not been, perhaps could not be, recast in the light of the second, as several topics which appear now under 'feeling' would have been much more in place under 'intellect'. It is true that Prof. Baldwin's classification is only in name the ordinary tripartite division, and is based, not on the preponderance of one or other of three primary and ultimate elements in the states called severally states of intellect, feeling, or will, but on the admission of three distinct '*functions*'—intellect marked by reference to a thing or object, feeling by reference to self, and volition characterised by effort or exertion (i. pp. 36, 37). Feeling, as thus understood, is not mere pleasure and pain, though pleasure and pain is a constant feature of it (vol. ii. pp. 86, 87), but is synonymous with sensibility (ii. p. 84). Even so, however, since sensation in its presentative aspect, and consequently the qualities of sensations, come under intellect (vol. i. p. 85), there is no ground for reserving the working of contrast, or relativity, of sense-qualities, until 'feeling' (vol. ii. p. 91). Again, '*belief*' is surely neither sensibility nor feeling in the sense of pleasure and pain, and to call it 'common ideal feeling' (ii. p. 243) is most bewildering. A still more obvious defect of arrangement is the awkward interpolation of some eighty pages on the nervous system at the beginning of vol. ii., coming thus after 'intellect' and under 'feeling'. Was it simply forgotten in its more appropriate place at the beginning of the Handbook?

Looking back to vol. i. for the general conception of consciousness, we find it a little hard to gather, owing to a certain looseness and irresponsibility of expression which Prof. Baldwin seems to have inherited from the Scottish friends to whom he owns obligation, though not allegiance (see preface to vol. i., second edition). Consciousness, he tells us, is both active and passive. "The highest" and also "the most *comprehensive* form of active consciousness" is apperception, "that activity of synthesis by which mental data of any kind (sensations, percepts, concepts) are constructed into higher forms of relation, and the perception of things which are related becomes the perception of the relation of things" (i. p. 65). From this and other statements about apperception and active consciousness, we expect the other, the passive, side of consciousness to be the sense data which are brought into connexion and unity by apperception. This is, in effect, the conception which seems *most* in harmony with Prof. Baldwin's general treatment, and it is sufficiently borne out by his view of the connexion between mind and body. It is as active—in virtue

of the unique character of the synthetic activity, which is without physiological parallel (p. 6)—that mind deserves to be the subject of a distinct science, and not a mere branch of physiology. The 'data of sense,' which Prof. Baldwin speaks of at one time as a "given manifold" (p. 319), and at another in the phrase much out of place in his psychology of an "undifferentiated sensory continuum" (p. 118), may, on the other hand, be referred back to, and causally explained by, physiological processes (pp. 27, 29, 55, 157, &c.). A doubt is, however, thrown upon this interpretation of the two sides to consciousness by the fact that in chapter iv. the terms *active* and *passive* are used for *concentrated* and *diffused* consciousness (p. 64). In the diagram illustrating the area of consciousness (p. 68), we pass from the extreme outer circle of consciousness, *viz.*, (1) the *unconscious!* through (2) the sub-conscious, (3) passive (or diffused) consciousness, (4) *active consciousness or attention*, to the innermost circle (5) apperception.

Apperception, or the "Apperceptive Function" rather, plays, as we should expect, an important part in intellect. It comprises presentation (sensation and perception) and representation (memory, association, imagination, and thought). It was a rather unfortunate oversight in the chapter on classification to give 'representative' as the alternative title for intellectual states, which are now seen to include presentative. The laws of association Prof. Baldwin reduces to two: the primary 'law of correlation,' which is a law of mental activity, and the secondary 'law of contiguity,' which finds its causal basis in physiological process. The facts brought under the first are undoubtedly of psychological value, and have been too little recognised, but it is a doubtful benefit to make the term association so wide as to cover both them and the more mechanical, or passive, connexions through contiguity.

The second volume shows a distinct advance in psychological insight, in spite of the confusion of arrangement. Prof. Baldwin has here felt his hand more free, and has made in many respects a nearer approach to a really scientific analysis of consciousness. After the digression already alluded to upon the nervous system, he gives us his general account of sensibility or feeling. It is defined "as the subjective side of any modification whatever of consciousness," or "the simple awareness of the unreflecting consciousness". To the precise mind, more information will be conveyed by the statement that "the most general characteristic of sensibility is pleasure and pain". "Simple sensibility," indeed, is "pleasure and pain," while "complex sensibility" is any complex in which pleasure and pain is an element. Obviously "complex sensibility" may have a wide range, and in effect we find it to cover a great variety of mental states from sensations, organic and special, to logical, moral and æsthetic judgments.

Sensuous pleasure and pain is defined, as might be expected from Prof. Baldwin's view of the physical basis of sensations,

through its physiological conditions. Pleasure is "the conscious effect of that which makes for the continuance of the bodily life or its advancement," pain "of that which makes for its decline". This is only partially true, for there is never the complete adjustment to environment which would make it applicable to every case; and, moreover, it does not help us to a *psychological* generalisation or explanation. The corresponding account of ideal pleasure and pains, as "the conscious effect of that which makes for the continuance of the apperceptive life or its advancement," and for "its decline and limitation" respectively, is similarly only partially true.

Under complex ideal feelings, Prof. Baldwin treats of common ideal feeling, *viz.*, interest, reality, belief, corresponding to organic sensation; and of special ideal feelings—corresponding to special sensations. These special ideal feelings comprise "emotions of activity," whether of adjustment (effort and ease) or of function (freshness, triumph, &c., hesitation, indecision, &c.), and "emotions of content," having reference to objects. This last is the largest class, embracing not only egoistic and sympathetic emotions but also "relational emotions," either logical or conceptual (systematic, ethical, religious, æsthetic). If we were to adhere strictly to Prof. Baldwin's own distinction between feeling and intellect, as having respectively reference to self and reference to external objects (i. p. 36), all the emotions of content, except the egoistic, would have to be ruled out of court.

Among the topics for which Prof. Baldwin claims originality of treatment, the account of "reality-feeling and belief" (ii. ch. vii.) is of considerable freshness and interest. He draws a very just distinction between the two. Reality-feeling is mere unchallenged presentation, existence in consciousness. It is primarily the note or *cachet* of sensations, the "sensational coefficient," because sensations are the primary material or content of consciousness. Belief is a later and more complex state, involving conscious reaction. The data for belief are (1) contrast between reality and unreality feeling, between presence and absence of the sensation, (2) need for the sensation and impulse to obtain it, (3) the gratification of that need, with the accompanying sense of security and confirmation. This account serves to bring out the important fact that the primitive consciousness does not pronounce judgment on its content—everything presented is at once accepted, and reality is simply presence. It is from contrast and contradiction within the content that doubt and belief arise, that consciousness becomes reflective and judges. Prof. Baldwin does not call attention, as we think he should, to the part played by the 'representation' of the absent sensation. It is true that the impulse, the need, may be aroused without the representation of what will gratify it, but in that case no conscious affirmation of reality (belief) will follow, but only a somewhat intensified "reality-feeling".

The "sensational coefficient" is made the basis of the belief in external reality. The features of this, as of every reality-coefficient, are intensity and uncontrollableness, and these are best realised in muscular sensations—sensations of resistance. Resistance is thus the ground of belief in external reality, while memory, as the ability to reinstate experiences of resistance at will, supplies a second criterion. Prof. Baldwin overlooks the part which consistency plays in confirming belief in even external reality, while in our opinion he overrates its place in belief in concepts and thoughts. He makes it here the exclusive basis, the "thought-coefficient". It is true that he understands by belief in this connexion only formal, logical assent, not realisation; but mere consistency does not yield even this unless it eventually leads back to premises having their roots in reality (existence). The effect of emotion, both in constraining and in colouring belief, is well recognised, and a very just comparison drawn between mere intellectual belief and what we call "realising" (p. 152). It is curious that so true a conception of this difference did not save Prof. Baldwin from the error of classifying 'belief' under feeling.

The "general conclusion" on reality and belief (pp. 168-171), and the criterion of reality there suggested, possess a considerable interest, though one not purely psychological. It lies in the hint given of a possible solution of some of the problems of modern thought. There are many indications that the new basis of faith, if there is to be one, will be psychological, that it will be based on the 'needs' of our nature, and will involve the recognition of sides other than the rational. The establishment of such a psychological basis demands, however, a more thorough criticism and analysis of 'needs' than we find in Prof. Baldwin's psychology. The number of 'original tendencies' and 'ultimate feelings' must be reduced, or their claims established instead of taken for granted. Whatever is meant by rational, moral, or æsthetic intuitions, empirical psychology cannot admit them as primitive and underived until every attempt to reduce them to simpler elements has proved futile.

A comparatively brief account of 'will' completes the work. Here again, though the analysis, and especially the importance attributed to 'reaction,' has its interest, we must take exception to the large number of original impulses or appetences (p. 322). Let us recognise the complex impulses, or rather the complex nature of the objects which arouse impulse in the developed nature, by all means; but recognition is not all. The business of psychology is to explain, to reduce to simpler and more general elements. We miss any adequate appreciation of this duty of psychology in Prof. Baldwin's work. He accepts the developed consciousness as he has it, or thinks he has it, and concerns himself with its analysis and description, but entirely leaves aside the question of its growth and development. This is a serious defect in a handbook of psychology. A worse one is

the failure to recognise the actual scope and limitation of the subject-matter. If, as Prof. Baldwin admits, the method proper to psychology is introspection, then the subject-matter is consciousness, not as *function* but as content. It may be legitimate and desirable to *infer* an activity apprehending and combining this content, and is so if the inference helps us to arrange and explain the data. But such activity is not itself given among the data. Introspection knows nothing of consciousness as activity, as "function," and it is a complete inversion of right method to begin a psychology with an assumption and account of *functions*, whether intellectual or volitional, whether apperceptive or rational. We look in vain throughout this work for any conception of the content of consciousness as a whole, as the subject-matter of a distinct science. Secure in his formal 'unity of function,' Prof. Baldwin has no scruple in admitting a break in the material 'unity of content,' in letting sensation and feeling pass into physiological process. A notable instance of this attitude is the way in which he disposes of the hypothesis of sub-consciousness (i. pp. 45-58), the force of which as an application of the law of continuity he entirely fails to appreciate.

In spite, however, of its serious defects, which may be lumped together as over-hastiness and want of a sound-guiding principle, these two large volumes give evidence of considerable acumen, of omnivorous reading, and, in the second volume, of power of original thought.

MARY E. LOWNDES.

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*Die neuen Theorien der kategorischen Schlüsse.* Von Dr. FRANZ HILLEBRAND. Wien: Hölder, 1891. Pp. 102.

Although, according to its title, Dr. Hillebrand's book is concerned with modern theories of categorical inferences, only about half of its hundred pages are really occupied with inference, mediate or immediate. For the theory of Syllogism is, as the author justly remarks, necessarily dependent on the theory of Judgment; hence he devotes the long second chapter to a consideration of the "Nature of Judgments".

Dr. Hillebrand requires the recognition of Judgment as a primitive psychical act; and this he does not find even in Hume, Mill, and Herbart, whom he regards as coming nearest to it. In his view, it is Brentano who has the merit of being the first to discern the real nature of Judgment, and to discover that not only is it inadequate to describe Judgment as a combination of ideas, but that this characteristic is not even essential to Judgment. Brentano is led to this view by a consideration of so-called Existential Propositions; *e.g.*, *There is an A*, or *A is*. These, he observes, cannot be explained as a combination of the idea of A with the idea of Existence—they indicate simply the

acceptance (*Anerkennung*) of A, and in the acceptance of A the idea of A's Existence is included—hence, since *A is* is a Judgment, Judgment does not necessarily include any combination of ideas.

According to Brentano's psychological analysis, all mental phenomena may be divided into three classes: Acts of Ideating, Judging, and Feeling (*Acte des Vorstellens, des Urtheilens, der Gemüthsthätigkeit*). These are distinguished from one another by different relations [of the mind] to an immanent object. The difference of relation which constitutes the distinction between ideating and judging is that, in judging, the "immanent object" is so regarded as that it may be accepted in a true statement (*cf.* §§ 16, 17). And that which stands in this relation to the mind is what we call "Existent"; the relation itself in which judging consists, being the source of the idea of existence, whereas (according to Dr. Hillebrand) other theories of judging deduce Judgment from the idea of Existence, and are therefore incapable of affording any explanation of the *fons et origo* of this idea. Since these other theories regard judgments as analysable into elements which are something other than judgment, they may be called Allogenetic, while Brentano's view, which regards it as ultimate, may be called Idiogenetic.

In Brentano's view, then, the mind in every judgment accepts some object as existent, and regards the proposition expressing the judgment as true. The acceptance of the object as existent, and the truth of the assertion in which there is this acceptance, are bound up together—where there is the one there is the other. If this might be understood to mean that every proposition "by its very nature lays claim to truth," and that every proposition implies the acceptance (as existent) of the matter referred to, the doctrine seems to me indisputable, though quite inadequate as a theory of Judgments or Propositions. For when we ask: *What* is it which is asserted in this truth-claiming and existence-implicating form? we find no answer; unless it is to be said that the *assertion* itself is asserted, or the *truth* of the assertion, or the *existence* of that which is referred to. Indeed, this last is the answer which is very strongly suggested by the "Existential" form of Proposition—although it is, with specially good reason, disclaimed by Dr. Hillebrand. Again, how can we deny the existence of that which, being the matter of judgment, has that unique relation to the judging mind in virtue of which we call it "existent"? (*cf.* p. 27, § 17, and p. 25, line 2). But do we not make such a denial in *e.g., There is no Sp?* If this proposition does not deny the "existence" of Sp, how is it to be interpreted? And if we admit that Existence can be denied, then that which has its existence denied must be ideated in order that it may be judged (*cf.* p. 20). *What* is it that is so ideated or thought of? Let us, however, put aside this question, and go on to consider some developments of Brentano's view as worked out by Dr. Hillebrand.

As a result of examining Existential Judgments, he denies that in judging we must "put two ideas together"; hence he holds that propositions need not be two-membered (*zweigliedrig*), and adopts Existential Propositions as the truest expression of judgment. Thus, instead of *A is X*, *A is not X*, he prefers to say, (1) *There is AX* or (2) *AX is*, (3) *there is no AX* or (4) *AX is not*. But the *There is* in (1) and (3), and the *is* in (2) and (4) are ambiguous, and it is a little hard to see what (2) and (4) mean unless the *is* = *exists*; or what (1) and (3) mean unless the *There is* signifies either vaguely (*a*) AX exists [does not exist] at *some* time and place; or (*b*) AX exists [does not exist] at a *definite* time or place. Dr. Hillebrand, however, emphatically disclaims this interpretation; and in the last chapter we find it declared that the expression *This plant* is a Judgment (p. 97 *top*), the pronoun *this* implying that acceptance in which Judgment consists. But if, *e.g.*, *This plant* is a judgment, what is to be said of the sentence *This plant is evergreen?* Again, to say that *This plant* is a judgment is, of course, to reduce the *is* and *There is* of Existential Propositions to mere signs of Judgment. But such reduction seems unwarrantable and paradoxical; and, moreover, if these are mere signs of Judgment (a Judgment being expressible by a solitary definite name), what *is* a Judgment, and in what respects does a Judgment differ from an idea?

Again, Dr. Hillebrand says (p. 28), that just as the Existential Proposition *S is* expresses the simple acceptance of S, so the Categorical Proposition *S is P* expresses the simple acceptance of the object (*Materie*) SP. But if it is on the strength of *S is P* that we admit an object SP, it seems obvious that *S is P* must be understood, in the first instance, as an assertion of Identity in Diversity—the numerical identity, namely, of *one* object, which both S and P denote or refer to, in the diversity of characteristics indicated by the diversity of the symbols S and P. But if this is the force of the copula in *S is P*, it is wholly different from that of the Judgment-sign *is*; and though *S is P* may explain *SP*, it does not explain SP *is*.

When from a consideration of the most generalised forms of Categorical Proposition—*S is P*, *S is not P*—we pass to a consideration of the more specialised forms, A—E—I—O, further difficulties arise. The classification suggested by the original twofold division would be into (1) A, I (*e.g.*, *All R* (S) is P, *Some R* (S) is P); (2) E, O (*e.g.*, *All R* (S) is not P, and *Some R* (S) is not P). But the primary distinction now taken is between A and E on the one hand, and I and O on the other. A and E are both regarded as negative, as not "accepting" but *denying* objects with certain characteristics; All R is Q = There is no Rq (Rq—), No R is Q = All R is q = There is no RQ = (RQ—). Both I and O are regarded as affirmative.

And here again we have to proceed as in the case of S is P, S is not P (unless indeed we reject altogether the universally admitted "two-membered" form of Categorical Proposition).

In order to extract There is no Rq, There is no RQ, from A and E respectively, E has to be first understood as a *denial*, and A as an *assertion*, of Identity in Diversity. We can deny that there is R which is not Q, only because A asserts that to every R the appellation Q is applicable; and it is only because E denies the identity of the objects referred to by R and Q respectively, that we can refuse to admit objects in which there is a combination of the characteristics signified by R and by Q. And similar considerations apply in the cases of I and O.

In the fifth chapter, on Compound or Double Judgments, we learn that though A, E, must be treated as purely negative when they are really Simple Judgments, yet in the overwhelming majority of actual cases, A and E are Double Judgments, and besides denying Sp and SP respectively, also accept S. The two so-called assertions are extremely different from each other; and it does not clearly appear how A (or E) is to be analysed so as to get the two out of it—and further, we are given no test by which to know the Simple from the Compound Judgments, though the differences between them are extensive and important when they come to be used in inference.

It would seem that either Prof. Brentano and Dr. Hillebrand must reject *S is P* and *S is not P* as general forms of affirmative and negative propositions, and hold to the traditional view of Logic as a Logic of Classes; or they must give up the grouping of propositions into I, O, and A, E, together with the corollaries involved. But to accept the last alternative would be to put aside the whole further development of the doctrines of Opposition and Inference with which Dr. Hillebrand provides us.

As regards Opposition, we learn that the only item of the traditional doctrine which can be admitted is the theory of Contradiction. A and O, E and I, are still to be regarded as incompatible and together exhaustive pairs of propositions. But the doctrines of Sub-alternation, of Contrariety and of Sub-contrariety do not hold. A and E may be true together, hence also I and O may be false together. In the denial of both Sub-contraries (Some R is Q, Some R is not Q), as in the affirmation of both Contraries (All R is Q, No R is Q), the non-existence of R is involved—whence it follows that the universe is *r*, a result that is not without difficulty. In these cases what is it that is denied, what is it that is the *matter* of the judgment? The validity of inference from A to I and from E to O is denied. As Dr. Hillebrand declares the *Dictum de omni et nullo* to be nothing more than the Principle of Sub-alternation (in which, I think, he is right), this view of Sub-alternation strikes at the root of the whole traditional doctrine of Syllogism. But something very like what has been rejected as Sub-alternation is brought back as the second of two ostensibly new rules of Immediate Inference which are given at the end of ch. iii. p. 69. This rule is to the effect that any "negative" judgment (A or E) may increase its Matter (*Materie*)—*i.e.*, that

any A or E may admit fresh determinations, positive or negative. Thus, from any assertions concerning a Class, we may infer a similar assertion concerning any sub-division of that Class—*e.g.*, from *All R is Q* (*There is no Rq*), I can infer, *All RX is Q* (*There is no RXq*), RX being a sub-division of R, that is Some R. Dr. Hillebrand's rules, as they stand, do not appear to apply to Mathematical Propositions.

Simple Conversion is said to be in all cases possible, but a merely verbal change, since it cannot matter whether I say, *There is SP* or *There is PS*, *There is no SP*, or *There is no PS*. The legitimacy of such Simple Conversion, however, as a general logical doctrine, is entirely given up in Anm. iii. p. 63, where it is said that in certain cases Simple Conversion would be illegitimate—*e.g.*, in the case of the proposition, Some man is dead.

Obversion ("Æquipollence") is allowed to be possible, but a mere verbal change, in the case of A and E—it is regarded as illegitimate in the case of I and O. Conversion per Accidens and Contraposition of E are not admitted as legitimate. Contraposition of A is allowed, and a (so-called) Contraposition by which *Some* S is not-P is changed to Some-not P is S. Dr. Hillebrand's conclusion is that "of all the Immediate Inferences which have been set out by logicians, it is only the Inferences *ad contradictoriam* which deserve the name" (p. 67).

After the doctrines of Simple Obversion and Conversion, we are introduced in chap. iv. to what are called Immediate Inferences from two premisses. They are of two forms (*cf.* pp. 70, 71):—

$$(1)\quad \left.\begin{matrix} \text{Ab} - \\ \text{A} + \\ \text{AB} + \end{matrix}\right\} = \left\{\begin{matrix} \text{There is no Ab.} \\ \text{There is an A.} \\ \text{There is an AB.} \end{matrix}\right.$$

$$(2)\quad \left.\begin{matrix} \text{AB} - \\ \text{Ab} - \\ \text{A} - \end{matrix}\right\} = \left\{\begin{matrix} \text{There is no AB.} \\ \text{There is no Ab.} \\ \text{There is no A.} \end{matrix}\right.$$

Of both of these it may be remarked that the conclusion decidedly is not obtained from the premisses alone, but from them taken in conjunction with the Proposition:—

*A is B or b.*

They look like distorted examples of the familiar Disjunctive Syllogism.

From (1) and (2), by substitution of M P S (and their negatives) for A B (and their negatives), we obtain twenty-four "Syllogisms with four Terms"—from (1), Syllogisms, having in Hillebrand's terminology one affirmative (and one negative) premiss, and an affirmative conclusion (in the traditional terminology, a particular premiss and conclusion); from (2), Syllogisms having (according to Dr. Hillebrand) two negative premisses and negative conclusion (in the ordinary use of logical terms, having universal premisses and conclusion). In these twenty-four are included all the traditionally

recognised forms of valid Syllogism, except Darapti, Felapton, Bramantip, Fesapo, which have universal premisses with a particular conclusion, and are excluded by the view that Subalternation is inadmissible. The nine extra moods are obtained by substitution of negative for positive Terms—s for S, and so on.

Two new rules of Mediate Inference are put forward—(1) that all valid Syllogistic moods must have four Terms, and (2) that *ex mere affirmativis nil sequitur* (which includes that from two negative premisses we get a conclusion, and from one negative premiss an affirmative conclusion). But these rules, strange as they sound, give us only Syllogisms which the traditional Logic does (or would) recognise as valid, and (2) proves on examination to be equivalent to the old rules (7 and 8) about particular premisses; and (1) does not admit four "Terms" in the sense in which they are excluded by the first of the old syllogistic rules, as appears from the fact that the new Syllogisms are all reducible to valid Syllogisms with only three "Terms" (in the sense of Class-names). And when a proposition is expressed as MP−, or SM+, MP and SM being complex names for some one object or group, the appropriateness of calling each constituent of either combination a *Term* is not quite obvious.

What is really novel in this Syllogistic scheme is the exclusion of any Syllogism with universal premisses and particular conclusion; and the substitution for the old *Dictum de omni et nullo* of the Laws of Contradiction, and Excluded Middle, and of the two rules of Immediate Inference already referred to above—of which, however, one, as already observed, seems to be closely akin to the rejected *Dictum*.

I think that Brentano's view is peculiarly interesting, because he has felt strongly certain defects of the traditional doctrine of Judgment and Syllogism, and seems at several points to have come within measurable distance of remedying them. He feels that to describe Judgment as the combination of two ideas is unsatisfactory, because there is *one* thing or group of things which is referred to in every Judgment (most obviously in Non-relative Judgments), and constitutes the *Materie* of that Judgment. He sees, again, that the object before the mind in ideating and in judging is the same—that in perceiving, say *SP*, and in judging *S is P*, the same identical thing (or group) is the object of my mental activity, but that there is a profound difference between ideating and judging—such a difference that Judgment is essentially unique and ultimate. But he has not succeeded in providing a satisfactory doctrine of Judgment in the place of those current doctrines which he so acutely criticises. And since—as Dr. Hillebrand has observed—the theory of Inference must depend on the theory of Judgment, if the latter is unsound the former must be unsound. That this actually is so in the logical scheme worked out by Dr. Hillebrand in the present book is what I have tried to show.

E. E. CONSTANCE JONES.

# VII.—NEW BOOKS.

*Distinction and the Criticism of Beliefs.* By ALFRED SIDGWICK. Longmans, Green, & Co.

In this book, which is in the press and will shortly be published, the problem how to deal with ambiguity of language is treated in a somewhat special manner. Ambiguity is only *effective* so far as it is subtle; words (like "pound") which mean widely different things are not in practice confused, but rather words which cover meanings most nearly alike; and accordingly it is in artificial sharpness of distinction (in the continuity of Nature and the discontinuity of Language) that the source of the most effective ambiguity is to be found. Common-sense exercises a kind of tact in using distinctions, treating them with considerable lightness; but so unconscious a method is naturally rather haphazard in its operation, and the main purpose of the book is to supplement 'common-sense tact' by making it conscious of its reasons. In the course of the inquiry several other topics of philosophical interest are discussed; chief among these are Controversy, the nature of Language, and the destructive power of Scepticism.

*The Nuptial Number of Plato.* By JAMES ADAM, M.A. Cambridge University Press, 1891. Pp. 79.

'The present essay claims to be a complete solution of the number of Plato' (Preface). I must leave the mathematics in it to mathematicians, and will only ask whether the solution itself, or the general reasoning by which it is reached, are such as to justify its claim to completeness. Mr. Adam's view of the main truth which Plato wishes to express seems to be this: that the maintenance of a perfect human society depends on the understanding and observance of a law of generation, to which man along with other animals is subject; that according to this law there are certain regularly recurring periods at which sexual union should take place if it is to produce the best possible offspring; that not only the particular organism man, but the whole universe, conceived as one all-containing organism, has likewise its periodic times of generation, and that this generation of the universe controls that of all the living things which it contains. So far as this I go with Mr. Adam, but the details of his interpretation puzzle me. It is based throughout upon the assumption (for it *is* an assumption, though Mr. Adam speaks (p. 46) as if he had proved it) that in determining the right periods for the generation of children Plato was guided by the period of human gestation. 'What he did was probably something of this kind. Taking the shortest period of gestation as his unit of measurement, *viz.*, 216 days, he divided a woman's life into periods of 216 days, from the day when first she was able to conceive a child. . . . During the time when Plato allowed woman to bear children (*i.e.*, between the ages of 20 and 40) she would, as far as the claims of maternity or other circumstances would permit her, unite with a bridegroom on the first day of each of these cycles, and possibly on other days within the cycle in which the number 6 predominated' (pp. 51-52). But if this is Plato's meaning, why does he say that human wisdom, however great, will sooner or later fail to calculate the right times for marriage, and that owing to this failure society must

sooner or later begin to decline? Given the starting-point suggested by Mr. Adam, 'the day when a woman was first able to conceive a child,' the subsequent calculation would seem to be easy. Where then does Mr. Adam suppose the difficulty to lie? 'The method of fixing the times of marriage,' he says, 'fails in the end, from no fault of our rulers, but *διὰ τὸ μὴ μένειν μηδὲν ἀλλ' ἅπαντα ἔν τινι περιόδῳ μεταβάλλειν*' (p. 44): 'Be our archons never so perfect, the ageing world will make their state decay' (p. 67): 'The race of man degenerates as the world grows old and weary of child-bearing' (p. 79). Let us then assume with Mr. Adam that Plato here had in his mind the idea which is developed in the *Politicus*, that the universe alternately moves forwards and backwards, waxes and wanes, for equal periods of time; let us assume that each of these pairs of periods is 72,000 years, and that this number is 'built up from the *πυθμήν* of the number 216,' which expresses in days a period of human gestation: what is the import of all these assumptions? 'As surely,' says Mr. Adam, 'as this goodly universe is begotten once every 72,000 years . . . so surely are there times and seasons for begetting man; for what is man but the universe epitomised? And just as the moment of the world's conception is discovered from its period of incubation, 36,000 years, so the right season for begetting children is to be determined from the period of gestation among mankind' (p. 78). We need not quarrel with the circularity which Mr. Adam himself admits in this reasoning; we may agree with him that 'when man discovers, or thinks he discovers, that the conditions which regulate his own nature are the laws that rule the whole, he realises, far more surely than before, that the conditions of his own nature are likewise laws, not to be violated without insult to the harmonies of heaven' (p. 78). But how is man to derive this moral support for his acts from the contemplation of a law of nature, when it is that very law which ultimately renders his acts ineffectual? It is like saying to him: 'If you wish to beget children at the right times, observe the period of human gestation; on reflexion you will find that this period is repeated on a vast scale in the universe; this discovery will strengthen you to resist the temptation to unregulated sexual indulgence; at the same time I must warn you that, however great your wisdom and self-control, the periodic changes which occur when the universe issues from and returns to chaos will baffle all your calculations and produce inevitable degeneracy in your offspring'. I may not have understood Mr. Adam rightly, but his conclusion does not seem to deserve the enthusiasm with which he regards it.

Nor is the reasoning by which he arrives at it convincing. The most prominent and characteristic idea in his essay is 'that the *περίοδος* of the *θεῖον γεννητόν* seemed to Plato to control the *γεννητά* which are within it'; this he considers to be 'the whole point' of the passage (p. 48, note 4). On what grounds? They are to be found partly in his interpretation of the clause *ὃν ἐπίτριτος πυθμὴν κ. τ. λ.*, partly in a combination of the whole passage with passages in the *Politicus* and the *Timæus*. As regards the former, the following difficulties amongst others suggest themselves: (1) He purports to have 'shown' from Aristotle's *Politics* that the number intended in the clause *ἐν ᾧ πρώτῳ κ. τ. λ.* is 216, taking Aristotle's words *λέγων ὅταν ὁ τοῦ διαγράμματος ἀριθμὸς τούτου γένηται στερεός* to be explanatory, not of *τρὶς αὐξηθείς*, but of the antecedent implied in *ὃν*. But if (as is necessary to his argument) *ἐπίτριτος πυθμήν* in Aristotle's quotation from Plato means the Pythagorean triangle with its area-number 6, how in Plato himself can it mean 12 (3 + 4 + 5)? Has he not first deduced 216 from a certain

meaning of *ἐπίτριτος πυθμήν*, and then deduced a different meaning of *ἐπίτριτος πυθμήν* from 216? (2) What is the sense of saying, as he supposes Aristotle to do, that the period of gestation is the 'beginning' of change in the ideal state? He emphasises a distinction between '*cause* of change' and '*process* of change' (pp. 42 and 68), but he does not make clear how the two are related. (3) Why should Plato have said *ἐπίτριτος* when, as Mr. Adam allows (p. 24), the *πυθμήν* is really *ἐπίτριτος καὶ ἐπιτέταρτος*? Is it not a queer way of defining a number to qualify it by an epithet which is both inaccurate and superfluous (see p. 25)? (4) What evidence is there, in Plato or elsewhere, that *πεμπάδι συζυγείς* can mean 'multiplied by five'? (5) Is it likely that *τρὶς αὐξηθείς* means here 'raised to the fourth power' when *τρίτη αὔξη* had 'become a stereotyped phrase for third dimension' (p. 27)? If the *τρίτη αὔξη* of 9 in *Republic*, 587*d*, means $9^3$, the 'increases' being reckoned from unity, why should not *τρὶς αὐξηθείς* be similarly reckoned here? Some of Mr. Adam's reasoning is ingenious and plausible, but it does not justify such phrases as 'absolute certainty,' 'I have shown,' 'I can prove it to the hilt' (pp. 22, 24, 25).

As regards the other source of his conclusions, he is doubtless right in holding that Plato is best explained from himself, but he does not sufficiently distinguish between illustration and proof. Take, for instance, his treatment of *τελεῖος ἀριθμός*. He first 'infers provisionally' (p. 48), from the fact that the same phrase is used in the *Republic* and the *Timæus*, that it means the same in both, promising that this shall be 'fully established' later. But the only 'establishment' that he gives is an interpretation of the myth in the *Politicus*, which, though interesting and suggestive, is certainly not conclusive. To mention one or two difficulties: (1) He makes much of the parallelism between human and cosmical generation; but whereas the right period for the former is supposed to be the period of gestation, the generation of the universe takes place at periods of *twice* its period of gestation (p. 77). (2) He treats the statement in the *Politicus* that God 'retired to His watch tower' as parallel to that of the *Timæus* that God 'abode in His own nature'; but in the *Timæus* the work of the secondary divinities begins with the retirement of the Creator, in the *Politicus* (272*e*) they accompany Him in his retirement. (3) The fanciful interpretation of *ἀριθμὸς γεωμετρικός* as the number 'which measures the earth' (p. 76) would, if it were true, make the periodic changes of the earth the same as those of the universe.

It is to be hoped that Mr. Adam will continue to study Plato, but that while retaining all his enthusiasm he will abate some of his dogmatism.

*Anthropological Religion.* The Gifford Lectures delivered before the University of Glasgow in 1891. By F. MAX MÜLLER, K.M., Foreign Member of the French Institute. London: Longmans, Green, & Co., 1892. Pp. xxvii., 464.

The third series of Glasgow Gifford Lectures do not present many points of interest even to the professed student of comparative psychology or philosophy of religion, while they make almost no appeal to the philosophical expert, as indeed the author himself seems to indicate (pp. 338-9). In two previous courses natural religion generally, and physical religion—the religious ideas connected with the attribution of causality to external phenomena—were discussed. The present work carries the investigation a step higher. Physical religion leads man to a "belief in one Superior Agent or God" (p. 181), but it leaves an "abyss separating God from man" (p. 182). Anthropological religion, on the

other hand, comprehends "the history of the various attempts at discovering something infinite and divine in man or mankind, beginning with the first surmises of the existence of something different from the body, and culminating in a belief in the divine sonship of man, the True Keynote of the religion of Christ" (p. 115). After some general considerations, occupying Lectures I.-IV., this evolution is traced from ancestor-worship, through animism in its various stages, and finally to the "apotheosis of the Divine in man". Throughout, the lectures are marked by the same wealth of illustration—especially from Indian sources—the same abundance of anecdote and reminiscence, and, occasionally, the same poetic fervour (*e.g.*, pp. 107 ff.) which rendered their predecessors so pleasing to the hearer. They have also similar defects. The psychology is not always what it might be (*e.g.*, Lect. VIII.). There are many remnants of Physical religion in Anthropological, while the latter contains a very great deal of Psychological religion, the subject which has just been treated in the concluding course. There are also some curious anomalies of detail. The "revelation of Divine Sonship in Christ" was hardly reached through Greek stages, as is implied; and even if it had been, our author would find it difficult to reconcile this "apotheosis" with the fact, upon which he rightly insists, of the Jewish aversion to the worship of a Divine which evinced itself in human form.

*Studies in Hegel's Philosophy of Religion, with a Chapter on Christian Unity in America.* By J. Macbride Sterret, D.D., Professor of Ethics and Apologetics in the Seabury Divinity School. London: Swan Sonnenschein & Co. Pp. xiii., 348.

The general purport of this book is well described in the Preface. "It is written with faith and in the interests of '*The Faith*,' though demanding an almost antipodal orientation or point of view to that of both deistic orthodoxy and ecclesiasticism." "It is mere time-serving to manufacture evidences where there are none." "It is *infidel* to refuse to welcome the Light lightening every man and every institution that comes into the world." "To discover the concrete Infinite immanent in, vitalising and educating, man throughout his history" is to supply "the key to the vital rationality of religion, interpreting and vindicating at their relative worth the many elements which, when put forth separately, are easily overthrown by scepticism". The work of Hegel "contains the philosophical key to the heart of the matter," reconciling "reason with religion by finding reason in religion and religion in reason". Dr. Sterret has performed his task well. His exposition of Hegel is accurate, and for the most part lucid; and his free adaptations and applications of Hegelian ideas are always interesting and valuable.

*An Essay on Reasoning.* By E. T. Dixon. Cambridge: Deighton, Bell, & Co., 1891. Pp. 88.

The author of this essay has previously shown great acuteness in criticism of the procedure of geometricians, and logical thoroughness in deducing a system of geometry from a few assertions with respect to *direction* and *position*. His *Foundations of Geometry* present the subject in a form probably superior to that of any elementary text-book. In the present work he aims at reinforcing his contention that the fundamental assertions of a purely deductive science are *Implicit Definitions*—not Axioms depending upon our assigning real import to the terms special to the science. The contention is of course not new, but the

test for determining the logical soundness of such an Implicit Definition seems ingenious. "None of the assertions must be independent of the meaning of the term [to be defined], and together they must not imply anything which is independent of that meaning" (p. 55). But how can we legitimately make these assertions without first assigning a *meaning, i.e.*, at least *subjective import* (as the author expresses it), to the term? After having tested the truth of the assertions, and having found that they contain no information which does not depend on our giving that particular subjective import to the term, it is true that we can temporarily lay aside all thought of the meaning, and proceed to make logical deductions. But the arbitrariness of the assertions applies only to the choice of the term or symbol to denote the particular concept. That the assertions are true of the concept is not arbitrary.

The rest of the essay appears to me independent of the main thesis, and to contain much error, confusion, and obscurity. Mr. Dixon expresses clearly enough the familiar commonplace of Logicians that, if we start with an arbitrary list of 'attributes,' the list of 'things' possessing those attributes is not arbitrary; and conversely. He, then, appears to recognise that four cases will arise, according as we have names of attributes or things whose application is determined directly or indirectly. But for simplicity he confines attention to the names of *things*, and considers throughout the work the two cases in which the application of these names is determined directly or indirectly. But by this procedure he destroys the reciprocal relation that he began by clearly enunciating. Every parallel that he draws between the two cases, therefore, breaks down, and the work becomes crowded with errors.

On the treatment of Propositions and Syllogism Mr. Dixon merely offers a confused rendering of the "Identification" interpretation. His whole work here is marred by the assumption that in a proposition the subject and predicate must both be determined denotatively or both connotatively. His own example (on p. 10), "Aristotle is-identical-with some man of extraordinary industry," expresses an *identity*, to which the most natural way of assigning *real import* is to define the subject denotatively and the predicate connotatively.

*Mental Suggestion.* By Dr. J. Ochorowitz, with a Preface by Charles Richet. Translated from the French by J. Fitzgerald, M.A. New York: The Humboldt Publishing Co.; London Agents: Gay & Bird. Pp. 369.

This translation may be recommended to English readers who have interested themselves in the work of the Society for Psychical Research. The account of the personal experiences which convinced Dr. Ochorowitz of the reality of "mental suggestion" does not occupy more than a small part of the book; but he has judiciously introduced this by two chapters in which he shows a full acquaintance with the various special causes of error, against which an investigator in pursuit of mental suggestion or thought-transference has to guard. Among these may be noted—besides mal-observation and conscious deception—the suggestions given by unconscious indications, natural associations of ideas tending to cause coincidence between the thoughts of the experimenter and those of his subject, the hyperæsthesia and hypermnesia that are sometimes manifested in the hypnotic state, and the specialised sensibility and peculiar imitativeness of a "magnetised" subject in relation to his "magnetiser". These and other sources of error Dr. Ochorowitz illustrates by a number of cases of merely apparent or merely

probable "mental suggestion" drawn from his own experience. Part ii., about half the book, contains a critical selection and discussion of facts recorded by other—chiefly French—investigators, tending to confirm and extend the conclusion to which Dr. Ochorowitz's own experiments have led him. Finally, in part iii., after a full discussion of other hypotheses, old and new, he concludes by indicating the lines on which a scientific explanation of his facts is to be sought. To say that the translator's English is uniformly correct and elegant would be too indulgent; but it is always readable, and appears to be substantially accurate.

*La Morale de Spinoza.* Examen de ses Principes et de l'Influence qu'elle a exercée dans les Temps modernes. Par RENÉ WORMS, ancien Élève de l'Ecole Normale superieure, Agrégé de Philosophie. Paris: Librarie Hachette et Cie., 1892. Pp. 331.

Spinoza exercises a potent and wide-spread influence on the thought of the present day. But one part of his teaching is comparatively neglected, and this is the very part which ought to interest us most—his practical Philosophy. As exhibiting in a clear light the extraordinary originality and value of this aspect of his system, the present work deserves cordial welcome. It consists of two parts, the first being a critical exposition of the ethical doctrine of Spinoza, and the second a historical survey of the influence of this doctrine on later thinkers. The exposition is accurate, clear, and extremely well written. M. Worms holds that Spinoza has combined in a higher unity the three leading ethical principles, which in other systems are separately emphasised—the egoistic, the altruistic, and the religious or metaphysical. The egoistic principle is represented in his philosophy by the impulse to self-realisation which constitutes the essence of every individual; but the satisfaction of this impulse is not to be found in the pursuit of external goods which continually leads to limitation, thwarting, and curtailment of our being by other finite existences, and especially by our fellow-men. It can only lie in the inner freedom of an activity which has no dependence on things external to the self. Hence the supreme and adequate satisfaction of the self-realising impulse is the love of God, as the immanent cause of our being. But the love of God necessarily includes the love of our fellow-men; for the same immanent causality which constitutes our being also constitutes theirs. In the historical part of his work M. Worms shows in a very interesting way how now one and now another of these three aspects of Spinoza's doctrine has been seized upon and made predominant by subsequent writers. But he shows a disposition to find Spinozistic affinities where they do not exist. Helvetius and Bentham remind him of Spinoza, because they erect an altruistic superstructure upon an egoistic basis. This seems to me to be entirely erroneous. The self-love which forms the point of departure of these writers is essentially distinct from the self-realising conatus. It consists in that very search after external goods which, so far from being identical with the conatus, is, according to Spinoza, merely a mistaken method of attempting to satisfy it. Accordingly, the derivation of altruism from self-love in Helvetius and Bentham has no affinity whatever with its derivation from the impulse to self-realisation. Good-will to our fellow-men is a means of gratifying self-love because it awakens in them good-will to us with all its manifold consequences. But good-will is, according to Spinoza, a satisfaction of our highest need, not because of its external consequences, but by its intrinsic nature as essentially bound up with the love of God. M. Worms brings into

clear light the contrast between the ethics of Spinoza and the ethics of Kant. But he fails to see that they are essentially akin, inasmuch as both regard the free self-realisation of reason as the highest good. This alone made it possible for the two lines of thought to meet and blend in post-Kantian philosophy. The mode in which this fusion took place in Fichte, Schelling, and Hegel is extremely well brought out by M. Worms. On the whole he may be congratulated on having produced a very readable book, and one well worth reading.

*Esprit et Liberté.* Par PIERRE-AUGUSTE BERTAULD, Ancien Élève d l'École normale supérieure, Professeur honoraire du Lycée Condorcet, et Ancien Membre du Conseil académique de Paris. Paris: F. Alcan, 1892. Pp. 458.

This book follows the same general lines as the author's *Etude Critique des preuves d l'Existence de Dieu.* It treats of the controversy concerning the existence of a soul, in which M. Bertauld takes the affirmative side. But he is convinced of the utter futility of all attempts to prove absolutely the thesis of Spiritualism by demonstrative argument. Accordingly his work is two-edged. On the one hand, he points out the logical flaws of the various arguments advanced by Descartes, Condillac, Jouffroy and others. On the other hand, he tries to show that in many cases the ideas, which form the basis of their ratiocination, have a value and relevance independent of the validity of the arguments themselves considered as formal demonstrations. Descartes and his successors have, according to M. Bertauld, signalised many facts of consciousness which point to the spiritualistic view as the most natural and probable hypothesis, although they cannot place it beyond the reach of doubt. In particular, they have shown that the most favoured alternative hypothesis, materialism, presents insuperable difficulties. For example, materialism is, in M. Bertauld's opinion, quite unable to explain the moral law except by treating it as an illusion. A considerable portion of the book is occupied in discussing the freedom of the will. The author identifies freedom with spontaneity or autonomy, and argues forcibly against indeterminism. His work will be found interesting and valuable by all who do not regard the question of which it treats as obsolete.

*Les Lois Sociologiques.* Par GUILLAUME DE GREEF, Docteur agrégé à la Faculté de Droit. Leçons D'Ouverture, École des Sciences Sociales, Université de Bruxelles. Bruxelles: Librairie Centrale des Sciences, 1891. Pp. 63.

In this brief Dissertation Dr. Greef (already known as the author of an *Introduction à la Sociologie*, and of several other works on cognate subjects) discusses the place of Sociology among the Sciences and the method of its study. His point of view is mainly that of Comte, but he introduces several interesting modifications into the teaching of his master. In the arrangement of the sciences, for instance, he is much more prepared than Comte was to recognise a distinction between the *πρότερα πρὸς ἡμᾶς* and the *πρότερα τῇ φύσει*—between the historical and the logical order of their development. He insists, further, on a distinction between both these orders and the educational order (*l'ordre dogmatique*), which he considers to partake to some extent of the character of both. Instruction should proceed partly along the line of natural historical development, but should at the same time seek to make apparent the logical connexion and subordination of studies.

While acknowledging these distinctions, however, Dr. Greef seems to think that the only essential difference between the historical and the logical order is that, while the latter is strictly serial, the members of the series in the former are partly simultaneous. The actual classification which he gives is based on that of Comte, beginning with Mathematics and proceeding through Astronomy, Physics, and Chemistry, to the science of life. On reaching this point, however, he introduces considerable modifications. After Chemistry he places Physiology (Vegetable and Animal), then Psychology (*Physiologie psychique*) including Logic (!), then Economics, then *Génésique* (the science of Population), then Æsthetics, then *Croyances* (Beliefs—(*a*) religious, (*b*) metaphysical, (*c*) positive), then Ethics, Law, Politics. He apparently regards this as the logical arrangement; but probably it will strike most readers as being rather a *dogmatic* arrangement.

With special reference to Sociology, Dr. Greef considers that its method of treatment ought to be strictly inductive. He believes that experiment might be to a large extent used in sociological investigations —for instance, in dealing with the problem of the limitation of the hours of labour. Unhappily he merely indicates this possibility, without explaining precisely how he conceives it should be done.

The last 20 pages of Dr. Greef's pamphlet are occupied with illustrations of sociological laws, drawn from the various departments which he has enumerated—*Economique*, *Génésique*, &c.

The pamphlet is one of considerable interest, though of course rather in the way of indicating the lines on which Dr. Greef is working than in that of supplying a satisfactory discussion of any particular points.

*Die Probleme im Begriff der Gesellschaft bei Auguste Comte im Gesammtzusammenhange seines Systems.* Inaugural-Dissertation der philosophischen Facultät zu Jena zur Erlangung der Doctorwürde vorgelegt von HERMANN LIETZ. Jena: G. Neuenhalm, Universitäts-Buchdruckerei, 1891. Pp. 97.

This Dissertation may be taken as one of several indications of an increasing interest in the work of Comte among German philosophers. It consists of two parts, one expository and one critical. In the expository part a copious and accurate analysis of Comte's sociological opinions is set forth. But it is naturally in the critical part that the main interest centres. Dr. Lietz begins by drawing a parallel, which seems somewhat exaggerated, between Comte and Kant. Then he criticises Comte's philosophy of History, chiefly on the ground that it represents history as a more straight-forward series than it actually is. He contrasts it in this respect with Hegel's appreciation of a dialectic movement in history. Dr. Greef's pamphlet on *Les Lois Sociologiques* seems to indicate a partial recognition, within the Positivist School itself, that Comte's arrangement of the facts of historical development is too rigidly serial. Dr. Lietz brings out also some evidences of one-sidedness in Comte's treatment of history; *e.g.*, in his disparagement of Protestantism in comparison with the Roman Catholic Church, without any due recognition of the element of advance. On the other hand, on Comte's analysis of the social conditions of his own time, Dr. Lietz has nothing but praise to bestow. He thinks that social and political philosophers have still much to learn from Comte's diagnosis of the characteristic maladies of our century. But the *pièce de résistance* in this pamphlet is undoubtedly to be found in the paragraphs that follow, in which Dr. Lietz deals with the relation of Comte's view of society to his general philosophical system. The main point which he seeks to bring out is that Comte is an Idealist

against his will. Even in his treatment of the natural sciences, his strenuous effort to see the world as a whole, his constant endeavour to apply the *esprit d'ensemble*, is taken as an evidence that Comte, in spite of himself, was guided throughout by a supersensuous ideal. Dr. Lietz considers that this idealistic element in Comte comes out still more clearly in his view of Ethics. "Comte," he points out, "was thoroughly anti-utilitarian, and took up the standpoint of the moral *ought*, of unconditioned duty. Now these conceptions are just as little consistent with the premisses of Relativism and Positivism as is the conception of Necessity itself, which also Comte makes use of on almost every page of his Philosophy of History." But it is chiefly in his view of Society that the idealistic side of Comte's philosophy comes into prominence. Having rejected the "entities" God and Nature, he retains, nevertheless, the great entity Humanity. What Dr. Lietz says on this point may be profitably compared with the corresponding passages in Caird's *Social Philosophy and Religion of Comte*, with which Dr. Lietz does not appear to be acquainted. At the same time it is well brought out in this pamphlet (p. 83) that, while Comte is Idealist enough to recognise the unity of the social organism, the fact that he has no ideals beyond Humanity prevents him from taking up a sufficiently critical attitude towards the actual achievements of mankind. He is too much disposed to "chanter les prodiges de l'homme . . . les merveilles de sa sociabilité". In this respect Dr. Lietz contrasts him with Kant and Fichte. These and other points are excellently brought out by Dr. Lietz; and his Dissertation altogether, though necessarily somewhat sketchy, is of great interest and value.

*Idee und Perception.* Eine erkenntnis-theoretische Untersuchung aus Descartes. Von KASIMIR TWARDOWSKI. Wien: Verlag von Carl Konegen, 1892. Pp. 45.

This pamphlet deserves attention from students of Descartes. The author points out that the words perception and idea are consistently used by Descartes in different senses, perception meaning the subjective act of apprehension, idea the immanent object of this act. He then takes up the question: What meaning have the terms clearness and distinctness respectively, (1) as applied to perception, and (2) as applied to ideas. A clear perception in Cartesian usage meant one in which the object was completely apprehended in all its parts. The same predicate applied to ideas has a different import. A clear idea is one in which is presented the essential attribute which forms the basis and presupposition of the rest. A distinct idea is one which is perfectly separated from all irrelevant matter, so that nothing is presented as part of its content which does not really form part of its content. The distinctness of a perception is constituted by the distinctness of the idea which is its object.

In the Cartesian epistemology clear and distinct ideas do not play the same part as clear and distinct perceptions. Both help to determine the validity of judgments. But a clear and distinct idea is only a condition of the possibility of a valid judgment, whereas the clear and distinct perception is the immediate cause of it. The pamphlet closes with a good collection of relevant passages from Descartes. M. Twardowski's results are perhaps stated without sufficient reserve and circumspection. But he is undoubtedly right in thinking that such work as his is adapted to throw light on the interpretation of the Cartesian theory of knowledge.

*Kleine Schriften.* Von HERMANN LOTZE. Dritter Band. Leipzig: S. Hirzel, 1891. Pp. lxx., 960.

This third volume, issued in two parts each as large as either of the earlier volumes, completes the collective edition of Lotze's scattered philosophical writings, to which his disciple, Dr. D. Peipers, has been devoting extraordinary care for some years past. The editorial characteristics that distinguished the two earlier volumes (1885-6) are even more strongly marked in the present one. In his anxiety to fix the writings in pure Lotzian form, Dr. Peipers has made elaborate recension of the original MSS. and of the author's corrected proofs whenever obtainable, and he notes, even to the minutest particulars of spelling, punctuation, &c., the changes he has felt bound to make upon the previous impression (in this or that periodical) of the different pieces. Such scrupulosity of restoration he thinks none too great in the case of a writer of Lotze's classical importance. Whether with the restoration there need have been all that detailed specification of it, may be doubted; but none can quarrel with the editorial piety that has provided an index of nearly 400 pages to a collection of writings so varied in character and subject. An index can never be too detailed, if the right man can be found to make it. Dr. Peipers has here done all that one man can to stem the reproach upon German scholarship of launching huge repertories of fact or opinion without clue to their use. The pieces now reproduced run from 1852 to 1880, just before Lotze's unexpected death in 1881. They include reviews of books, mostly from *Gött. gel. Anzeigen*, with the preliminary announcements that he made there of his own works, and also two or three independent essays. The article on "Philosophy in the last Forty Years," contributed in 1880 to *The Contemporary Review*, first as it was to be of a series never there carried further, is, in default of the original, here reproduced in its translated English form. In all probability, as Dr. Peipers by detailed argument seeks to establish, it was meant to be followed by the paper which, under the title "Die Principien der Ethik," saw the light, after Lotze's death, in a German periodical. This paper (not, by the way, of much importance) is here given in Appendix, because not published by Lotze himself; and is followed by a fragment on Goethe (pp. 542-51) also found among his remains, giving utterance to an old man's altered feeling and judgment with regard to the poetic idol of his youth. There are given, besides, two unpublished pieces from early Leipsic days: one in French (*à la* Leibniz), "Pensées d'un Idiote sur Descartes, Spinoza et Leibniz" (pp. 551-66), apparently written after he had finished his original *Metaphysik* (1841); the other, a fragment "Geographische Phantasien" (pp. 567-75), seeking to explain the secret of men's attachment to their place of birth and early home. It is impossible, with such a varied collection, to do more than give this external indication of contents. But an expression of warm thanks is due for all that Dr. Peipers, and previously Prof. Rehnisch (editor of the *Dictate*), have done to complete the presentation of the life-work of the most remarkable of German philosophic thinkers in the second half of this century.

*Geschichte der Philosophie.* Von Dr. W. WINDELBAND, Professor an der Universität Strassburg. Vierte Lieferung. Freiburg i. B.: J. C. B. Mohr, 1891. Pp. 385-516.

This is the final instalment of the novel survey of history of philosophy to which Prof. Windelband has been committed since 1890 (see MIND xv. 430, xvi. 295, 550). A novel survey, both because he had already worked over great part of the field (in *Gesch. d. neueren Phil*, 1878-80; *Grundr. d. alten Phil.*, 1888), and because his plan here is to signalise the various questions that in each successive period exercised the philosophic mind and to set out the answers given to them, rather than to deal with the succession of individual thinkers. The present instalment, after com-

pleting the account of the "Philosophy of the *Aufklärung*," is mainly occupied (pp. 417-90) with "German Philosophy". A dozen pages or so are then added, at the end, upon "Nineteenth Century Philosophy," meaning all thought that is not to be connected directly with the Kantian movement held to have run out in (the aged) Schelling and in Schopenhauer. Prof. Windelband is not at his best in these concluding pages. The reason may partly be that he is reserving himself for an extended treatment of the manifold thinking of the present century, to be appended as third volume to his *Gesch. d. n. Phil.*; but if he is there going only to fill in the rough outline now given, some reconsideration of it seems desirable. Though it is true, as he says, that the century shows no other supreme philosophical achievement after Hegel's, it is hardly an adequate representation of its varied strivings to mark but two questions of "Conflict about the Soul "and Nature and History". Nor is this latter question satisfactorily formulated when "historical" consideration is opposed as philosophically rational to "natural-scientific". Prof. Windelband has, of course, a meaning of his own with this opposition, but, when a place has to be found under his "History" for the scientific evolutionism of the period, the antithesis surely loses all point. And it must be added that his notions as to representative thinkers within the century are sometimes rather curious. Thus, as regards this country, one is surprised to find T. Belsham, J. Fearn, G. Combe, S. Baley (*sic*) and H. Martineau put forward, with Brown, the Mills and Bain, for Association-psychology; or to be referred to G. Cogan, with J. Austin and Cornewall Lewis, for Utilitarianism; or under the Scottish school to come upon the names of S. (*sic*) Morell and H. Wedgwood. But to dwell longer on these or other such instances of foreigner's misapprehension would give an altogether wrong impression of the value of Prof. Windelband's present handling. His small-type references throughout the book are, for the most part, as good as they are full; and his exposition, within the lines set himself, is in general masterly. The manner of treatment, by prominent questions, is indeed not always equally effective or even applicable. It is more suitable for extended periods, like the pre-Platonic or the Scholastic, where a large number of more or less like-minded thinkers have to be brought together, than for times dominated by the personality of this or that philosophic hero. Accordingly, it is not always adhered to with uniform strictness. But of the book as a whole, it is safe to say that no other recent compendium shows the same amount of grasp and insight. And a gust of freshness blows all through it. If a really competent translator (who could also make the desirable additions or corrections in the matter of references) would take it in hand, he would do a real service to the English student, still left dependent upon foreign guidance (that has any value) over the historic field of thought.

*Einleitung in Die Æsthetik.* Von KARL GROOS, Privatdocent der Philosophie an der Universität Giessen. Rickersche Buchandlung, 1892. Pp. 409.

The distinguishing feature of this work is the attempt to give a description, if not an elucidation, of the Æsthetic Consciousness from a purely psychological standpoint. The first of the three parts into which it is divided is devoted to the consideration of the nature of the material upon which the æsthetic judgment operates, and the region of Consciousness to which this operation is restricted. In Part II. the *distinctive* character of the object of æsthetic contemplation is determined. These *three* momenta constitute a systematic exposition of the æsthetic doctrine favoured by Dr. Groos, of which the following is a brief summary. The object of the æsthetic consciousness is a construction of the productive

imagination (der ästhetische Schein). In this purely mental image only the internal or intensive relations of its constituent manifold are envisaged, and these are the only relations by which the æsthetic consciousness is engrossed. To a botanist a flower is interesting as belonging to a certain class, to a florist as having a certain market value, but a poet only sees the symmetry and harmony of its colour and contour. Dr. Groos treats in great detail a chief characteristic of the æsthetic cognition, termed by him *die innere Nachahmung*. The æsthetic contemplation of the object in imagination is an activity (*Thätigkeit*), and this activity consists in the internal or mental imitation of the object externally presented. Now, continues Dr. Groos, this process of internal imitation is the very centre and kernel of æsthetic enjoyment. When the eye traces the outline of a form, or the ear follows the magic modulations of a melody, there is always an internal imitation of the external stimulus, and by this act of imitating the æsthetic image is constructed. But again we have to ask, What there is *distinctive* in the act of æsthetic imitation? To this our author replies (p. 94), following Siebeck, every object viewed æsthetically presents itself as personified. Now whence comes this Personification? In dealing with this question Dr. Groos seems to quit the comparatively firm ground of psychological analysis, and ventures on the treacherous quicksands of mystical speculation.

In the Third Part of his treatise Dr. Groos applies the theory previously established to the analysis and explanation of some of the most salient modifications of the æsthetic consciousness: (1) The Beautiful, (2) The Repulsive, (3) The Sublime, (4) The Tragic, (5) The Comic. In discussing these various aspects of æsthetic representation, Dr. Groos touches upon many questions of supreme interest to the student of the fine arts. One of these especially has given rise to much controversy; *viz.*, How far and in what way the repulsive and unpleasant lends itself to independent æsthetic treatment. Dr. Groos defines *das Hässliche* as that which is repulsive to sense in an æsthetic image, (*das sinnlich Unangenehme im ästhetischen Schein*) (p. 283). From this definition it is difficult to see how the deformed and repulsive can ever furnish material for *absolute* æsthetic construction. The soundest doctrine seems to be that the function of the hideous in art is to enhance the effect of the beautiful. Our author will not go to the extreme of maintaining "le beau c'est le laid," but holds that the æsthetic field has been very much widenened since "le vrai le beau, et le bien" have ceased to be identified. For our part we regard the discords of Wagner, the unwholesome situations of Ibsen, and the pure filth of Zola as equally æsthetic paradoxes.

*Die Lehre Hegels vom Wesen der Erfahrung und ihre Bedeutung für das Erkennen.* Von Dr. GEORGE KENT, Pastor an der Johanneskirche in Christiania. Christiania: Jacob Dybwad, 1891. Pp. 80.

In June, 1881, the Berlin Philosophical Society proposed as a theme for a prize essay: "A Critical and Historical Account of the Dialectic Method of Hegel". Pastor Kent heard of this at so late a date that it was impossible for him to compete. The subject interested him, however, and he accordingly wrote the present essay. He declares, at the outset, that "it is written by a man whose professional work leaves him little time for philosophical production, but by one who is a decided Hegelian". The essay is divided into five sections: (1) Hegel's Theory of Knowledge; (2) Hegel's Notion (*Begriff*) of Experience; (3) Hegel's Teaching concerning the meaning of Experience; (4) Experience and the Hegelian Method; (5) The Significance of Hegel's Philosophy. Of these the first and third form more than three-fourths of the whole. Dr. Kent thinks that the abstract formalism so often charged upon the Hegelian method

receives little warrant from Hegel himself, but is due to the erroneous interpretation of disciples, especially of the Left. This he proposes to prove. The essay is little more than a reiteration of familiar doctrines, though the prominence accorded to the problem of perception is unusual. The *Encyclopädie* is regarded as superior to the *Phänomenologie*—the theory of knowledge stands out more by itself. By collating selected passages an account of Hegel's doctrine of perception is given at some length. This is developed after the orthodox dialectic manner. "The transition from 'perception' to 'experience' takes place when the actuality of the universal is determined." In the course of his discussion Dr. Kent animadverts on the empirical or inductive view as represented by Mill and Jevons. It affords only an abstract account of knowledge. Hegel transcends and includes this in his discovery of difference amid identity of the subject and object. Zeller's middle course between Hegel and the empiricists is condemned as unnecessary; Hegel's position is practically the same, and is much more clearly explained. Dr. Kent admits, nevertheless, that, with the assistance of modern realistic knowledge, Hegelianism might be largely supplemented and readjusted, though without alteration of its fundamental tenets. As a whole, the essay shows considerable familiarity with Hegel's works. Its chief defects lie in a lack of expository power, and in a want of appreciation of more recent results of psychology.

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W. James, *Text Book of Psychology.* London: Macmillan & Co. 1892. Pp. xiii., 478.

J. Royce, *The Spirit of Modern Philosophy.* Boston & New York. Houghton Mifflin & Co. 1892. Pp. xv., 519.

Karl Pearson, *The Grammar of Science.* London: Walter Scott. 1892. Pp. xvi., 493.

C. Secrétan, *La Civilisation et la Croyance.* 2e édition. Paris: F. Alcan. 1892. Pp. 396.

E. de Roberty, *Agnosticisme.* Paris: F. Alcan. 1892. Pp. 164.

Ch. Renouvier, *Principes de la Nature.* 2e édition. Paris: F. Alcan. 1892. 2 Vol. Pp. 299, 407.

G. Rodier, *La Physique de Straton de Lampsaque.* Paris: F. Alcan. 1891. Pp. 133.

J. Jaurès, *De la Réalité du Monde sensible.* Paris: F. Alcan. 1891. Pp. 370.

L. Arréat, *Psychologie du Peintre.* Paris: F. Alcan. 1892. Pp. 264.

H. Schwarz, *Das Wahrnehmungsproblem.* Leipzig: Duncker & Humblot. 1892. Pp. 408.

R. Avenarius, *Der menschliche Weltbegriff.* Leipzig: Reisland. 1892. Pp. 95.

F. Raab, *Wesen und Systematik der Schlussformen.* Wien: C. Konegen. 1891. Pp. 52.

E. G. Husserl, *Philosophie der Arithmetik.* Bd. 1. Halle: C. E. M. Pfeffer (R. Stricker). 1891. Pp. 324.

E. Dillmann, *Eine neue Darstellung der Leibnizischen Monadenlehre.* Leipzig: Reisland. Pp. x., 525.

Avv. Enrico Piccione, *Le leggi biologiche et le leggi giuridiche in rapporto alla questione sociale.* Roma: Forzani. 1892. Pp. 108.

N. R. D'Alfonso, *Lezioni elementari di psicologia normale.* Milano—Roma: E. Trevisini. 1891. Pp. 148.

# VIII.—PHILOSOPHICAL PERIODICALS.

THE PHILOSOPHICAL REVIEW.—Vol. i., No. 1. Prof. J. Watson—*The Critical Philosophy and Idealism.* [Expounds and enforces the system of idealism educed from Kant by Caird under the guidance of Hegel. This article is marked by the lucidity and acumen characteristic of its author.] Prof. G. T. Ladd—Psychology as so-called "Natural Science". [It is pointed out that the real value of Prof. James' great work lies in its purely psychological matter, not in "various exceedingly thin and dubious diagrammatic representations of brain-processes occasionally interjected into the discussion of psychological phenomena". Prof. Ladd's criticism seems to us to be just and effective.] Benj. Ives Gilman—On some Psychological Aspects of Chinese Musical System. [A careful account of Chinese music, "based upon observations of performances by native musicians".] Reviews of books, including a Notice of Spencer's *Justice* by the Editor. Summaries of Articles.

AMERICAN JOURNAL OF PSYCHOLOGY.—Vol. iv., No. 2.—Prof. Jastrow contributes a very interesting series of "Studies from the laboratory of experimental psychology of the University of Wisconsin". What he calls "a novel optical illusion" is worth attention. It was found that if before a rotating disc composed of a large sector of one colour and a small sector of another, the two differing considerably in shade, a rod, held horizontally, be passed up and down, the whole disc seems broken up by horizontal parallel bands of a colour similar to that present in greater proportion. If the disc be composed of three or more colours the bands appear composed of several colours, and this holds even when there is a perfect fusion of the segmental colours with the disc rotating at a high rate of speed. By changing the conditions of the experiment it was found that the bands originated probably "during the vision of the minority colour," and Prof. Jastrow puts them down as due to the persistence of after images. Dr. E. C. Sanford continues his admirable "Laboratory Course in Physiological Psychology," treating in this number of taste, smell, and hearing. The further observations on the brain of Laura Bridgman are described at some length by Prof. Donaldson, who also, in connexion with J. L. Bolton, contributes a paper on the size of the cranial nerves in man.

In the INTERNATIONAL JOURNAL OF ETHICS (Jan., 1892) Brother Azarias writes on 'The Ethical aspects of the Papal Encyclical,' and the Rev. J. Macbride Sterrett gives a well written account of the 'Ethics of Hegel'. Mr. J. S. Mackenzie prints the first part of a lecture on "The Three Religions": perhaps a more significant title would have been "Religion and Two Half-religions," since his main point is that "while the Agnostic Religion is nothing else than worship of the unknown, and the Religion of humanity is in its essence nothing else than the worship of the moral power in man," true religion—and popular Christianity is its essence—is the faith that there is no real separation of power from goodness. Mrs. Hertz contributes an enthusiastic review of Frau von Suttner's novel, "Die Waffen nieder!" (1891), which is described as "the most forcible protest ever uttered against the stupendous evils, the egregious madness, of war"—all the more remarkable as written by a German. Professor H. Nettleship writes judiciously, but without remarkable originality, on "Authority in the sphere of conduct and intellect". In the "Discussions" Mr. James Seth urges familiar arguments in favour of the retributive theory of punishment, in reply to the papers by Mr. Rashdall and Dr. Tönnies; but as he takes the latter's paper as "representative of the de-

mand for the substitution of the 'deterrent' and 'reformative' theories," he can hardly be supposed to have read it; since it was a main aim of Dr. Tönnies to bring home to his readers the failure of actual legal punishments either to deter or to reform, and the necessity of admitting and acting on this failure.

In the PROCEEDINGS OF THE SOCIETY FOR PHYSICAL RESEARCH (Part xx.) the most important article is one on "The Subliminal Consciousness," by Mr. F. W. H. Myers, in which a comprehensive hypothesis is offered to explain the recognised phenomena of automatic writing, alternations of personality, and the hypnotic trance, as well as the more disputed telepathy. Hypnotic experiments have familiarised the world with the fact that gaps in a man's ordinary chain of memory, such as sleep and trance, may be filled by psychical activities having a secondary chain of memory of their own, which is in a sense more comprehensive than the primary;—since the fully hypnotised subject as a rule remembers waking life in the hypnotic trance, but not *vice versâ*. It is further established that the consciousness or cerebration belonging to the hypnotic state can exercise over the nervous, vasomotor and circulatory systems a degree of control unparalleled in waking life; of which Mr. Myers gives some striking instances, recorded by careful experimenters. To explain these and cognate facts, Mr. Myers supposes that beyond the habitual consciousness of any individual there exists a range of conscious action of unknown extent "forming some part of his total individuality," and "included in an actual or potential memory below the threshold of his habitual consciousness". This "subliminal consciousness" may be supposed to include the psychical counterparts of organic processes beyond the control of ordinary volition; and Mr. Myers would also refer to it telepathic impressions, which he supposes to be received by "aid of adits and operations peculiar to the subliminal self". Such "subliminal" psychical activity influences the ordinary or "supraliminal" in various ways and degrees; sometimes injuriously, as when its disorders are manifested in hysteria and self-suggested maladies; sometimes beneficially, as when the hypnotic trance is therapeutically used.

REVUE PHILOSOPHIQUE.—16e année, No. 12. L. Dauriac—Un problème d'acoustique psychologique. [An interesting exposition and criticism of Stumpf's theory of simultaneous fusion. This theory is said to be based on two postulates: (1) That attention, adding nothing to the content of consciousness, merely discriminates its constituent parts. (2) That the range of psychical reality is wider than the field accessible to introspection. These assumptions are contested by M. Dauriac.] M. Fouillée—Les origines de notre structure intellectuelle et cérébrale. II. L'évolutionnisme. ["The forms of our thought are nothing but the essential functions of our primitive and normal volition, to which correspond the essential functions of our physiological life." The principles of identity and sufficient reason are treated from this point of view in an interesting and—so far as concerns Psychology—in a convincing manner.] G. Séailles—Léonard de Vinci artiste et savant. [An interesting study of the harmonious fusion of artistic and scientific genius.] J. Passy—Sur les dessins d'enfants. [A record of observations possessing both educational and psychological value.] A. Binet—Sur un cas d'inhibition psychique. [We fail to catch the true expression of a feature when it is out of keeping with that of the rest of the face. Figures are given in illustration.] Analyses et comptes rendus, etc.

17e année, No. 1. C. H. Dunan—Le problème de la vie. [Organisation must be regarded as belonging to the world as a whole, not merely to particular organisms. Universal organisation cannot be explained as

a product either of mechanical or of final causes, or of both combined.] B. Perez—La maladie du pessimisme. J. M. Guardia—Philosophes espagnols de Cuba : F. Varela, J. de la Luz. [An interesting article.] G. Mouret.—Le problème d'Achille. Analyses et Comptes rends, etc.

17e année, No. 2. A. Binet—Les mouvements de manège chez les insectes. [The rotatory movements produced in insects by lesion of their ganglia are involuntary. They are primarily due to the legs on one side being more strongly innervated than those on the other, and secondarily to the physiological associations through which all the legs co-operate in executing the movement, when it is once begun.] Ch. Dunan—Le problème de la vie. [The unity of universal organisation is simple and indivisible like that of universal space and time. The only admissible conception of it is that of a metaphsical (*i.e.* hyperphysical) reality, one in its essence, but evolving itself in time and space under the form of an endless multiplicity of movements. Its real unity is the ground of the formal unity of time and space, and of their connexion with each other.] J. M. Guardia—Philosophes espagnols de Cuba (fin.). Belot—Justice et socialisme, d'après les publications récentes. [Includes a criticism of Spencer's *Justice.*] Notices bibliographiques, etc.

Zeitschrift f. Psychologie u. Physiologie d. Sinnesorgane. Bd. iii., Heft 1. H. v. Helmholtz—Versuch, das psychophysische Gesetz auf die Farbenunterschiede trichromatischer Augen anzuwenden. [A continuation of the article "Versuch einer erweiterten Anwendung des Fechnerschen Gesetzes im Farbensystem" in Bd. ii. of the Zeitschrift. The most important points are: (1) The new determination of the three ground-colours as carmine-red, ultramarine-blue, and yellowish green (green of vegetation). The red end of the spectrum is, therefore, no longer the starting-point for the Young-Helmholtz theory of colour-vision. (2) The referring of the perception of colour-differences to a more original perception of differences of brightness (*Helligkeit*).] R. Greeff—Untersuchungen über binokulares Sehen mit Anwendung des Heringschen Fallversuchs. The judgment of distance may depend essentially upon the perspective retinal images of binocular vision (Wheatstone, Hering), or upon the muscular movements of the eye (Brücke). In Hering's *Fallversuch*, the reagent judges whether a ball falls on the near or far side of the fixation-point, under conditions which are meant to exclude the possibility of such movements. Dr. Greeff improved the apparatus, to meet the objections of Donders; and obtained the following results. (1) The perception of distance is the same when the visual axes are converged, parallel or divergent: in the latter case, provided that the double images are still to be combined. (Noteworthy for the psychology of sensation is the correction of sensation by theoretical reflexion, p. 33.) Monocular results were correct in 50 p. c. of the experiments; as probability would lead one to expect, on Hering's theory. (2) The *Fallversuch* gives valid results for greater distances, where convergence and accommodation do not come into consideration, provided that the balls are clearly to be seen, and that the distance between the balls which fall before and behind the fixation-point is large enough in relation to the remoteness of this point from the eye of the observer. This relation is definite. Dr. Greeff also experimented upon binocular vision with monocular reduction of clearness of sight; and upon binocular vision in cases of squinting.] A. Pick—Bemerkungen zu dem Aufsatze von Dr. Sommer, "Zur Psychologie der Sprache". [In Bd. ii. Dr. Sommer described a patient who was unable to give the name of objects presented to him, till he had written them down. It was proved that the objects did not call up the ideas of their names either

as heard or seen; but simply the movements necessary for the writing of the names. Dr. Sommer asks: What is the connexion between sight of an object in this case and the graphic movements? And are there known physiological or pathological cases in which memory-ideas can be called up by movements, and in which amnesia results, if the movements are prevented? Prof. Pick in answer calls attention to the researches of Charcot, Binet and Ballet. It is certain (1) that for many normal persons the memory-ideas of words consist of ideas of the movements necessary for writing them down; (2) that in certain pathological cases words must be written before they can be pronounced; and (3) that in all cases where the original constituents of the word-ideas have been lost by disease a *suppléance fonctionelle* occurs: other constituents take their place in consciousness,—graphic the place of auditory, *e.g.* This was the state of Dr. Sommer's patient. As regards the first question, Prof. Pick concludes that ideas of graphic movements formed the connecting-link between the sight of the objects and the movements themselves.]

Archiv für Geschichte der Philosophie.—Bd. v., Heft 2. E. Zeller—Plato's Mittheilungen über frühere u. gleichzeitige Philosophen. [A consideration of the different ways in which Plato, by the dramatic form of his dialogues, is led to take account of his philosophical precursors and contemporaries. Most of the author's points had previously been made in the course of his *History*, but the subject is one that lends itself with advantage to the present mode of special treatment. Chief interest attaches, perhaps, to the Protagorean references, here set out at some length. Noteworthy also is the attempt to connect Antisthenes with more than one of the positions successively stated and refuted in the *Theætetus;* but how conjectural such attempt is, appears on comparison with the very different, yet not less confident, surmises of Dr. H. Jackson. The only point not doubtful—and this is well brought out by the venerable historian at the close of his article—is the wealth of allusion to contemporaries which lies locked up in Plato's artful exposition. A. Döring—Der Begriff der Dialektik in den Memorabilien. [Shows that the Xenophontic Socrates understands διαλέγειν, now in a stricter sense of conceptual determination, and now in a wider sense of general argumentation.] A. Gercke—Ariston. [A careful discrimination, in respect of their writings and relations to other thinkers, between the Peripatetic Ariston of Ceos and the Stoic Ariston of Chios, who from the first were more or less confounded by the ancient authorities.] P. Tannery—Deux nouvelles lettres inédites de Descartes à Mersenne. [One of them very forcibly confirms what was known already of Descartes' disgust, in 1646, with the *Fundamenta Physices* of his whilom ardent admirer Regius.] Jahresberichte.

Vierteljahrschrift für wissenschaftliche Philosophie. Bd. xvi., Heft 1. A. Riehl—Beiträge zur Logik, I. [Discusses the nature of concepts and of judgment. The logical predicate is always either actuality (*i.e.*, reality for sense) or objectivity (*i.e.*, reality consisting in a necessity imposed on thought by its objects). This distinction is made the basis of a division of judgments into two classes. Riehl thinks that his view of judgment has most affinity with that of Bradley, although he inverts B.'s use of the terms, subject and predicate.] Ad. Nitsche—Die Dimensionen der Wahrscheinlicheit und die Evidenz der Ungewissheit. F. Rosenberger—Ueber die fortschreitende Entwicklung des Menschengeschlechts. (Schluss.) B. Seligkowitz—Ernst Platner's wissenschaftliche Stellung zu Kant. I. A. Marty—Ueber Sprach reflex, Nativismus und absichtliche Sprachbildung.

*Some Notices have been unavoidably crowded out.*

# IX.—NOTES.

## CONTRIBUTION TO THE PSYCHOLOGY OF VISUAL DREAMS.

While investigating the general subject of dream-life I have become particularly interested in the influence of the *Eigenlicht* of the retina upon visual dreams. Observations to establish this influence are, of course, not new; and some writers have perhaps been disposed to set upon it a sufficiently high estimate. More or less extended and fruitful remarks are, therefore, to be found in the works of Johannes Müller (*Phantastische Gesichtserscheinungen*, 1826), Gruithuisen (*Anthropologie*, 1810, und *Beiträge zur Physiognosie und Heautognosie*, 1812), Purkinjé (*Beobachtungen und Versuche zur Physiologie der Sinne*, 1823-26), Maury (*Le Sommeil et les Rêves*, 1878), Radestock (*Schlaf und Traum*, 1879), Wundt (*Grundzüge der Physiologie*), and others. In particular have Von Graefe and Siebeck remarked upon the effects of diseased and over-excited conditions of the eye, of "phosphenes," &c., in inducing visual phantasms.

Of all these writers the observations of Müller and Maury, conducted upon themselves, most resemble my own. It will serve my present purpose, then, to refer to these authors with somewhat more detail. Müller (p. 20 f.) declares that he rarely fails to see, before falling asleep, "with closed eyes and in the darkness of the field of vision," a great variety of highly illumined and coloured images. From his earliest youth he remembers having noticed these phenomena, and always well knew how to distinguish them and their rapidly changing forms and movements from the peculiar images of dream-life. They rarely take the shape of recognisable realities, but customarily form fantastic figures of men, animals, and what not, such as he never saw before. "I often follow these appearances," says he, "for a half-hour, until they finally pass over into the dream-images of sleep."

In another place (p. 49) Müller declares that certain dream-images *are* "nothing else than the luminous phantasms which appear in the visual substance, before going to sleep, when our eyes are closed". The origin of these phantasms he refers to intra-organic stimulation, especially in connexion with changes in the blood-supply of the organ.

Maury treats of his experiences of this sort under the head of "hallucinations hypnagogiques". He affirms (p. 79) that he has "often established the passing-over of a luminous image, due apparently to the excitement of the optic nerve, into a clearly defined figure whose formation it was possible to follow". It would seem, then, that the confidence of both Müller and Maury in the theory that "the stuff" of certain dreams or the material made into many of their visual dream-images, originates in the scheme marked out in the "retinal phantasms" by chance variations in the blood-supply, was chiefly based upon their ability to follow the retinal phantasms up to, or into, the visual hallucinations of dream-life. Now my method of experimenting with myself has been the exact opposite of this. It has, I believe, enabled me to establish several interesting points of importance not only for the entire theory of visual dreams but also for a better understanding of waking states of perception and of the psycho-physical mechanism employed in the production of such states. Some of these points will be given here, as established to my satisfaction *in my own case*. Further evidence and criticism are invited before confidence can be established in their validity in all cases.

But, first of all, let me briefly describe the method of my very simple experiments. To appreciate them it must be remarked that the retinas of my eyes are probably somewhat unusually sensitive to excitement from intra-organic and cerebral stimulation. I have found by inquiry that a large proportion of persons unaccustomed to observe themselves for purposes of scientific discovery are entirely unacquainted with the phenomena of retinal *Eigenlicht*. Ask them what they customarily see when their eyes are closed in a dark room and they will reply that they see nothing. Ask them to observe more carefully and describe what they see, and they will probably speak of a black mass or wall before their eyes, with a great multitude of yellow spots dancing about on its surface. Some few will finally come to a recognition of the experience with which I have long been familiar in my own case. By far the purest, most brilliant, and most beautiful colours I have ever seen, and the most astonishing artistic combinations of such colours, have appeared with closed eyes in a dark room. I have never been subject to waking visual hallucinations, but I verily believe there is no shape known to me by perception or by fancy, whether of things on the earth or above the earth or in the waters, that has not been schematically represented by the changing retinal images under the influence of intra-organic stimulation. And as Müller, Maury and others have noticed, any form of unusual cerebral excitement is conducive to very lively activity among the retinal phantasms.

Equipped, then, with the instrument of such a psycho-physical mechanism for the production of visual images, I have been accustomed to experiment in the following way. I "set" this mechanism so that it will dip down into sleep and dream-life, with a gradual curvature, as it were, and then come out of dream-life in an instant; i.e., by a steep curve. When I wake in this way, I am ready to do two things pretty nearly simultaneously—namely, to retain in mind the visual images of the dream from which I am awaking, and also without opening my eyes (which would, of course, spoil the experiment) to note in terms of objective waking consciousness the schematic phantasms which are fading from the retina. Thus a comparison between the phantasm, as objectively observed and localised in the retinal field, and the visual images of the dream, as detained and remembered for a brief time, becomes possible. To set the psycho-physical mechanism of sleep so that it shall run down, and I awake within from two to five minutes after falling asleep is much easier for me than to set it so as to wake at any given hour in the early morning. Indeed, the latter I find it difficult or impossible to do with much approach to accuracy. I am therefore inclined to think that with a little effort and practice many will find themselves able to perform upon themselves my simple experiments.

It will be observed that the method I have employed, when it is successful, actually catches the retinal schemata as they are vanishing from the retinal field, and then compares them with the visual dream-images which they have already produced. The method employed by Maury watches these schemata as they are engaged in the process of producing visual dream-images. I arrest the impish phantasms before they can can get off the stage of my dream. I see clearly what they have been doing. Maury arrests them rather while they are coming upon this stage, and endeavours to catch them in the act of beginning their dramatic transformations. It seems to me that my method is perferable; especially since, when it succeeds, it conducts the crucial part of the experiment under the eye of a clear objective waking consciousness.

By this method of experiment, then, I have established as good in my own case, the following conclusions.

1. The visual "stuff" of those dreams which occur soon after falling asleep is largely, if not wholly, due to excitement of the retina by intra-organic stimulation. These dreams, as respects their origin, are thus distinguished from those which occur under ordinary circumstances in the morning hours. The latter are oftener due to external stimulation—i.e., to the rays of light penetrating to the retina through the closed eyelids. But inasmuch as the sleep of many persons during several hours of the night is a succession of naps interrupted by more or less partial awakening, both the retina and the visual centres of the brain may prove sources of origin for visual dreams. Those visual dreams however, which follow almost immediately on going to sleep in a dark room originate, wholly or chiefly, in the *Eigenlicht* of the retina. The vital action of the retina (and hence the variety and rapid movement and wonderful transformation of the retinal schemata) diminishes rapidly with the duration of sleep. The dreams into which the retinal phantasms have woven themselves are forgotten beyond recovery before the morning hours. Hence the visual dream-images which are remembered on awaking, will be more likely to be derived from external stimulation.

At the same time it must be remembered that, while the threshold of consciousness rises rapidly, as respects susceptibility to external stimuli, during the first hour or two of sleep, the *relative* sensitiveness of the soul to all intra-organic changes is greatly increased, This fact gives an enormous influence to the more feeble and slow activities of the retina, even some time after sleep has begun. And, as has already been indicated, partial or complete awaking, if caused or followed by increased cerebral excitement, will have a tendency to renew the sensitiveness and more active condition of the retinal field.

2. Probably few or none, of the visual images of our dream-life are deprived of all accompaniment and support from an excited retina. But since the ordinary conditions of normal sleep are such as both to diminish the intensity of the surrounding light and also to lower the sensitiveness of the organ of vision to the action of light, the relative importance of intra-organic excitement of the retina for all visual dreaming, becomes at once apparent. There is probably little such dreaming that is wholly independent of the arrangements which light and dark spots, dots, lines, etc., in the retinal field, assume under the changing vital conditions of this part of the visual organism. Almost without exception, when I am able to recall the visual images of my dream and to observe the character of the retinal field quickly enough to compare the two, the schemata of the luminous and coloured retinal phantasms afford the undoubted clue to the origin of the things just seen in my dream-life. This is emphatically true whenever the imagery of the dream is purely imaginative rather than accompanied by memory and recognition.

It seems to me impossible, then, to make a hard and fast distinction between visual perception and visual imagination in dream-life so far as the origin of their sense-elements is concerned. The end-organ of vision is actively engaged in furnishing certain elements of the visual images, from whichever point of view their combination is to be regarded. In saying this, however, I by no means intend to depreciate the part played in the drama by the psycho-physical activity of the central organs. It is to occult processes which go on within the cerebrum that we must look for the physiological antecedents of the

elaborated, associated, meaningful and memorable character of the visual shapes of our dreams. The data of sense to be discovered in the retinal field, when considered with a cool, scientific, and objective consciousness, are thin, pale and almost senseless schemata. They are like the few strokes and dots which my friend, the "chalk-talk" artist, dashes upon the black-board with his white and coloured crayons. The draughtsman puts these data upon the black-board; the retinal activity copies their outlines; but it is only on the basis of complicated psycho-physical activities lying further back and above in the brain that we *see the things* which we are invited to see.

What I am inclined to believe, however, is this—that, in dreams as well in all waking perception we neither see nor imagine aught without participation of the retinal changes in the complex psycho-physical process. And if this is so, we are enabled to understand how visual images in dreams may furnish all the necessary elements of that objectivity which things seen in dreams certainly possess.

3. The most elaborate visual dreams may originate in intra-organic retinal excitement. Perhaps a harder problem could not be given to my experiments to solve than the following: How can one be made by such excitement to see a printed page of words clearly spread out before one in a dream? How can so orderly a visual phenomenon owe its origin to chance arrangements of the "retinal dust"? But I have several times verily caught my dreaming automaton in the feat of having just performed this transformation. On waking from a dream, in which I had distinctly seen lines of printed letters forming words and sentences and had been engaged in reading these lines by sight, I have clearly detected the character of that retinal field which had originated such an extraordinary hallucination. The minute light and dark spots which the activity of the rods and cones occasions, had arranged themselves in parallel lines extending across the retinal field. In other words, the clearly printed page which I was reading in my dream faded away into an object that appeared to my waking consciousness like a section of an actual page of print when seen through an oval hole in a piece of paper at too great a distance to distinguish more than an occasional fragment of a word, and even that dimly.

If the superior psycho-physical mechanism of vision can in dream-life seize upon what is really nothing but rows of meaningless blackish spots upon the retina and can convert them into imagined pages of print which may be read with great satisfaction off-hand in a dream, what is it not capable of achieving? That it can cut all manner of capers in hermeneutics I know by abundant experience. And the variety of material in the shape of dots, dashes, splashes, lines and angles which are furnished by the retinal *Eigenlicht* is infinite. Some one has declared that the secret of the painter's art is to represent everything with two strokes and a dot. Whether this be so, or not, in the finished product of art, when it is to be brought under the eye of the wide-awake critic, this is indeed the secret of the retina's art in sleep. Brain and mind are no critics of such arts when they, too, are asleep. All manner of inanimate things, of animals, plants, and human beings, seen in dreams, may resolve themselves into the fantastic schemata of the retinal field, if we can only manage to surprise these schemata with an observing critical consciousness.

The data afforded by "retinal dust" may, of course, unite with other data of sense and products of imagination in the dramatic representations of dream-life. To illustrate this I will briefly recite a dream of mine which doubtless originated in a combination of visual phantasms

of the retina with entotic sounds. The dream ended in too much astonishment, however, to make it possible for me actually to observe the retinal field on waking.

I was standing in a gloomy grove, regarding fixedly a small black object lying on the ground, of about the size and shape of a garden slug. Suddenly the thing began to swell with astounding rapidity. Almost before I could get out of its way, it had grown to the dimensions of a large hogshead; and it had also begun to move with a speed out of all proportion to its enormous size. From place to place the huge black thing, or animal (?), darted in the grove; and each time it struck one of the trees of the grove the unfortunate object of its attack vanished in smoke. Finally the monster itself exploded into countless fragments, and I awoke. Doubtless some enlarging and moving dark blotch on the retinal field had run its customary course--parallel, however, to the rhythmic occurrence of certain entotic noises.

4. The retinal phantasms, like all the other data derived by excitement of the end-organs of sense, are, within certain limits, under the influence of fixed attention and volition. It is well known that some persons can create for themselves hallucinations of the sense of sight which have all the objectivity of things when seen with waking consciousness and under the clear light of day. As I have elsewhere said: "In the case of perception with a moving eye, we can, to a certain extent, decide the area over which the point of regard shall sweep and the relative attention to be given to the subdivisions of this area. Furthermore, and especially in the case of geometrical figures, it often lies in our power to decide how we will interpret certain data which admit of more than one interpretation."

What is true of vision when it originates in external stimulation of the retinal area is true likewise of vision which originates in intra-organic stimulation of the same area. Within certain limits—rather narrow, to be sure—we can see what we look for and wish to see, and we can choose our interpretation of what we see by the *Eigenlicht* of the retina as well as by the sunlight. Very frequently I have only to choose some simple schema such as would serve as a frame-work for a corresponding object, *fixate* it in idea with closed eyes and *will* steadily to have it appear, and in due time it will more or less completely construct itself in the retinal field. Nor do I believe that in such cases the influence of ideation and volition—or, speaking physiologically, of the cerebral centres—upon the intra-organic activity of the retina is altogether merely selective; it appears also to be determinative. Idea and volition, with their correlated psycho-physical cerebral processes, can (to a certain extent) determine the condition of the retinal field. How we are to understand the physiology of this influence from the ideational and voluntary centres of the brain upon the end-organ of sense I do not know. Of the fact of such influence I am confident.

But in sleep the mechanism of the cerebral centres is the principle seat of those changes which distinguish dream-consciousness from waking consciousness. In this truth, then, we have another reason for the strange, irrational, rapidly shifting and intermingling way, in which the visual images of our dreams are constituted and interpreted. On the one hand the data of sense furnished by the end-organ of vision are changeful and capricious. They are not like the steady stimulations of the orderly arrangements of light-rays reflected from a real object. On the other hand the superior psycho-physical mechanism which combines, elaborates and interprets these data is, for the time being, partially freed from the laws which control its action in waking consciousness.

5. Finally, I have always noticed a marked change in the character of the muscular adjustment and movement of the eye on passing from dream consciousness to waking consciousness. Indeed, one chief factor in converting the passive spectator and unconscious author of the visual dream-images into the active and critical investigator of the retinal schemata is just this muscular change. I have had great difficulty in determining precisely in what the change consists. But of the existence and distinct—nay, decisive—influence of such a change, I am perfectly sure.

I am inclined to think that on closing the eyes for sleep the eyeballs are, as has been customarily supposed, turned upward and inward. This position is probably most favourable to the disappearance from consciousness of all disturbing visual images. Perhaps in deep and dreamless sleep (and for purposes of my present inquiry "dreamless" sleep means sleep in which no images of things seen rise above the threshold of consciousness) this position of the eyeballs is maintained unchanged. But I am inclined also to believe that, in somewhat vivid visual dreams, the eyeballs move gently in their sockets, taking various positions induced by the retinal phantasms as they control the dreams. As we look down the street of a strange city, for example, in a dream we probably focus our eyes somewhat as we should do in making the same observation when awake, though with a complete lack of that determined teleological fixedness which waking life carries with it.

But what change in muscular adjustment of the eye takes place when I come out of the dream consciousness and promptly betake myself to the psychologist's task of studying the fantastic shapes that are fading from my retina? Then I focus both eyes for a point of regard as close as possible in front of the eyes, and in the direction which the phantasms occupy in the retinal field; and I steadily fixate them there with that rigidity of muscular control which belongs to waking attention. *It is the marked change in the muscular sensations and in the feeling of fixated attention which characterises my waking perceptive consciousness.* This change is necessary to the recognition of the schemata in the retinal field as the components of those fanciful beings with which my "mind's eye" has held commerce in the dream.

Such are some of the conclusions to which I have been led by my experimental studies of this very interesting class of phenomena. Need I add that to me they seem to verify the general theory of perception which I have elsewhere advocated. This theory regards all seeing as resulting from a psychical synthesis interpreting data of sense, and denies the possibility of drawing any fixed line between illusions and hallucinations, between what we call imagination and what we call perception of sense.

GEORGE TRUMBULL LADD.

ARISTOTELIAN SOCIETY.—The following papers have been read before the Society:—On 14th December, "A Criticism of Evolutionary Ethics" by Mr. J. H. Muirhead. On 11th January, "The Permanent Meaning of the Argument from Design" by Mr. B. Bosanquet. On 25th January, "The Philosophical Pons" by Mr. S. H. Hodgson, President. On 8th February, "The Meaning of Life" by the Rev. Dr. W. L. Gildea. On 22nd February, "Theories of Pleasure" by Mr. G. E. Underhill. A meeting was held at Cambridge on 7th March, when in a symposium the question, "Is the distinction between 'Is' and 'Ought' ultimate and irreducible?" was discussed by Prof. H. Sidgwick, Mr. J. H. Muirhead, Mr. G. F. Stout, and Mr. S. Alexander. Mr. L. T. Hobhouse, M.A., and Mr. J. C. Bowen have been elected members. The Proceedings of the Society, Vol. 2, No. 1, has just been issued.